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A SYSTEM OF GYNECOLOGY

AND OBSTETRICS

BY AMERICAN AUTHORS.

EDITED BY

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GYNECOLOGY.

VOLUME II.   PART II.

ILLUSTRATED WITH WOOD ENGRAVINGS.

THE MALIGNANT DISEASES OF THE UTERUS.

By W. T. LUSK, M. D.,

NEW YORK.

THE malignant diseases of the uterus comprise the various forms of carcinoma, tumors characterized by the presence of epithelial formations, and sarcomatous growths composed mainly of the round and spindle-shaped cells of connective tissue. Although differing in many respects as regards their clinical features, they possess in common a tendency to infect neighboring tissues, to recur after removal, and ultimately to destroy the life of the patient.

CARCINOMA UTERI.

FREQUENCY.—No physician needs to be reminded of the frequency of uterine cancer. In the statistics gathered by Sir James Y. Simpson from the report of the Registrar-General's Office, of 87,348 deaths from cancer in England between the years 1847 and 1861, inclusive, 61,175 occurred in women and 25,633 in the male sex. Up to the fifteenth year the difference in the death-rate in the two sexes was immaterial. With the advent of puberty a marked change in the relative proportion became manifest. Thus, between the fifteenth and twenty-fifth years the ratio of males to females was 100 : 123 ; between the twenty-fifth and thirty-fifth years, 100 : 255 ; between the thirty-fifth and forty-fifth years, 100 : 367 ; and between the forty-fifth and fifty-fifth years, 100 : 335. The difference then became less pronounced, though through all the decades following the deaths were nearly twice as frequent in the female as in the male. The extent to which the preponderance in women is due to uterine cancer has been demonstrated by Schroeder, who, from statistics collected from various sources, found that of 19,666 cases of cancer in the female sex, 6548 were of uterine origin. Wagner, in tables based upon the post-mortem records of Vienna, Prague, and Leipsic, showed that in 5112 autopsies there occurred 441 cases of cancer, and of these 113 were of uterine origin. Emmet states that of 2153 women admitted to the Woman's Hospital,

60, or 2.78 per cent., had malignant disease of the uterus, and of 2447 women in his private practice suffering from sexual disorders, 53, or 2.19 per cent., had uterine cancer. Glätter estimated that 2.5 per cent. of all the women in Vienna over twenty years of age die of uterine cancer. Hofmeier[1] states that in the Berlin Polyclinic, of 16,800 patients, 603, or 3.6 per cent., suffered from uterine cancer, and that in Schroeder's private practice, of 9400 patients, 299, or 2.18 per cent., were victims of the disease, the latter percentage corresponding almost exactly to that reported by Emmet.

PATHOLOGY.—The old familiar division of uterine cancer into scirrhus, medullary cancer, colloid cancer, and epithelioma has at the present time ceased to be tenable. It was based upon tactile impressions, physical appearances, and peculiarities of growth. It represented not distinct varieties, but accidental conditions or successive stages of development. It served to introduce into the subject an element of confusion detrimental to progress, as rarely two observers were found in agreement as to the classification of the disease in the same patient.

A true pathology is necessarily based upon minute structure, modes of development, and variations due to site. The following description is gathered from the works of Ruge and Veit, whose investigations correspond closely with clinical experience, and to whom we owe the principal distinctions upon which modern treatment is based.

All writers have distinguished cancer of the body of the uterus from that of the cervix. Ruge and Veit have rendered an important service by demonstrating, in addition, the essential independence of cancer of the vaginal portion and cancer of the cervix proper (cervical mucous membrane and adjacent structures).

A. *Cancer of the Body of the Uterus* (Ruge and Veit).—Cancer of the body of the uterus always develops from the endometrium. The malignant growth may be of a villous character, or may occur in the form of wart-like protuberances varying in size from a pea to that of a bean. It may be diffused or circumscribed.

The diffused form in most instances involves the entire surface of the mucous membrane to the os internum, the cervix long remaining unaffected. In rarer instances the greater part of one wall remains free, or a nodular growth upon one side corresponds to a depression in the opposite wall, while at a higher point the reverse relation may exist. Commonly, the associated irritation leads to uterine hypertrophy, as in early pregnancy. A thinning of the muscular walls occurs only in cases of rapid growth. The cavity may become narrowed ; sometimes it becomes of an S-shape, or where extensive destructive changes

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[1] "Zur Statistik der Gebärmutter Ruhes," *Zeitschrift für Geburtshülfe und Gynäkologie,* vol. x. p. 270.

have taken place it may be converted into a vast cloaca, the walls of which remain rigid or have an apparent eccentric growth, in which at

Fig. 190.

Cancer of the Body of the Uterus, diffuse form (Ruge and Veit).

times the disintegrated tissues may be retained by the narrowing of the os internum.

In the circumscribed and polypoid form the growth is attached by a pedicle to the uterine walls, and depends into the uterine cavity. Its further extrusion is not superficial, but radiates toward the peritoneum. If these polypoid bodies disintegrate or are thrown off to a great extent, nodular bodies may persist in the uterine walls; but the occurrence of primary nodules in the muscular structures, unconnected with disease of the endometrium, is extremely questionable.

Under the microscope primary cancer of the body presents two forms, both of which have their origin in changes which take place in the glandular structures of the endometrium.[1]

[1] This section is placed in connection with carcinoma of the body, as the changes in the latter are similar to those which take place in the cervix.

In the one form the glands push out lateral offshoots which unite with one another and assume a trabecular arrangement with little intervening stroma. The ciliated cylindrical epithelia proliferate and become large flat epidermoidal cells. The glands increase sometimes to more than fifty times the normal size. The cell-proliferation may be confined to one wall, gradually encroaching on the central canal, which assumes

FIG. 191.

Section through Cancer of Portio: *p*, pavement epithelium; *k*, cancer; *kn*, cancer-nodules; *dr*, remains of gland.

a curved shape, while upon the opposite wall there persists a single layer of cylindrical cells; or the process may develop in different portions of the gland, between which the gland structures may preserve for a time a nearly normal appearance.

In the second form the glandular type is in general preserved. The central canals of the normal glands enlarge, and offshoots are pushed from the walls inward, or outward into the circumjacent connective tissue. From these primary offshoots new outgrowths form, and this process continues until the original gland is converted into a tangled mass of coiled bodies in which the canal proper is restricted to narrow dimensions. But in the rule only one layer of cylindrical cells attach to the processes, and it is exceptional for the cells to undergo polymorphous changes.

In both varieties the retro-peritoneal and lumbar glands are early affected; the barriers of the internal os may be passed, and the cervical canal be secondarily invaded; the disease may extend to the bladder or rectum—an event occurring usually, though not without exception, after preliminary peritoneal adhesions; the invasion of the parametria is commonly of late occurrence, and, as a consequence, death from uræmia occurs more rarely than in cervical cancer; and metastatic nodules may develop in almost all the organs, the vagina furnishing a frequent seat of these formations.

B. *Cancer of the Vaginal Portion.*—Ruge and Veit[1] define as the vaginal portion the part extending from the os externum to and somewhat beyond the vaginal attachment. The forms of carcinomatous disease seated within these limits are manifold, without, however, the degree of development being determined by the external appearances alone, nor do typical microscopical appearances always correspond to characteristic clinical phenomena.

In the rule, the smallest changes and the slightest tendency to extension are induced by the nodular variety. Thus, a circumscribed shallow ulcer with cancerous borders may result from the discharge of a superficial nodule, or the disease may penetrate deep into the tissues and give rise, as the new formations separate, to deep funnel-shaped excavations characterized by the very moderate extent of the invasion of the adjacent tissues. Allied to these are cases of apparent enormous losses of substance, in which the carcinoma spreads to the vagina, and the vaginal portion disappears as the result

Fig. 192.

Adenoma Malignum (Ruge and Veit).

of absorption and fatty degeneration, and a large cancerous funnel is left, the apex of which extends to the cervical canal.

Cauliflower growths begin as small papillary elevations, respecting the os and extending toward the vagina. The surface has either the appearance of granulation tissue, easily distinguishable from the moist shiny surface of true erosions, or, as is more common, presents the whitish-yellow aspect of pronounced cancer. In the course of further development the superficial indifferent tissue is thrown off, and the growth into the vagina is either fungiform, with a relatively smooth and slightly arched surface, in which case the changes in the portio are seldom deep, or it occurs as a large tumor covered with villous outgrowths which fill the entire vaginal space.

Thus in the several forms of carcinoma of the vaginal portion the disease usually tends to invade the vagina, though sometimes it finally attacks the parenchyma of the cervix. In such a case the ulceration resulting from the breaking down of the tissues assumes a crater-like form, with the apex directed toward the cervix. In its progress the disease tends to overleap anatomical boundaries, and may attack the bladder, the body of the uterus, the intestines, and the peritoneum. But the body of the uterus is never attacked in the early stages. Second-

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[1] "Der Krebs der Gebärmutter," *Zeitschrift der Gynäk. und Geburtskunde*, Bd. vii. p. 138.

ary corporeal carcinoma only occurs after the upper part of the cervical parenchyma has been invaded.

Carcinoma of the vaginal portion in its several forms respects the limits of the os externum, spreads toward the vagina, and has no tendency to invade the cervical mucous membrane. Metastases are first seen in the vagina, and then present the characteristics of the soil in which the disease was originally developed. Thus metastases are glandular if the disease of the vaginal portion was of the glandular type.

As a slight exception to the general rule as to the essential independence of cancer of the portio and of the cervix, Ruge and Veit admit in certain cases changes in the cervical glands bordering upon the os externum—changes which, however, are recognizable only by means of the microscope. In cases of ectropium the growth seated upon the everted mucous membrane may be mistaken for one upon the vaginal portion. Finally, cancer of the cervix and portio may in rare instances coexist : whether occurring as independent processes or whether the one is secondary to the other is a matter which has not as yet been determined.

Fig. 193.

Carcinoma of Vaginal Portion of Uterus, disease invading parenchyma of cervix (Ruge and Veit).

The greater number of carcinomatous affections of the vaginal portion are derived from newly-formed glandular structures (erosion-glands), which undergo in their subsequent course the same changes that have been described in connection with carcinoma of the body.

In rare instances the simple glandular form is preserved (adenomatous form), the gland-tubules, lined with a single layer of delicate cylindrical epithelium, penetrating deep into the tissues. Often the tubules lie close together, so that the intervening stroma is completely destroyed.

In addition to these glandular forms, Ruge and Veit recognize a third variety—viz. carcinomatous cauliflower growths derived from connective tissue, in which the proliferative process begins beneath the pavement epithelium. The latter may either remain for a long time intact, or a thinning may ensue, with widening of the papillary spaces and gradual disappearance of the intervening epithelial pegs. Cancer is formed from these fungous elevations in consequence of degenerative

changes in the deep-lying, small round stroma-cells. These changes consist in the increase of the cell-protoplasm and the enlargement and multiplication of the nuclei. The cells become aggregated, forming cancer-nests, contained in large alveoli separated by narrow partitions of connective tissue.

C. *Cancer of the Cervix* (*Cervical Canal and Adjacent Structures*).— Cervical cancer may be derived either from a connective-tissue proliferation or it may be of glandular origin.

The connective-tissue form occurs first as a nodular body situated beneath the intact mucous membrane, with a special tendency to spread outward toward the vaginal portion. It may likewise extend upward toward the cervix or deep downward until the epithelium of the vaginal portion is nearly reached. The cervical orifices are, however, respected. In the end the growth may break through the mucous membrane, undergo destructive changes, and lead to the formation of a cavity, the walls of which may be derived from cervical, or in advanced cases from paracervical or parametritic, tissues. At an early period the disease may extend upward and invade the uterine muscular tissue and undermine the uterine mucous membrane. In these cases the vaginal portion often long persists, the finger passing above the external os into a great ichorous excavation.

The glandular variety resembles the uterine form. The surface is uneven, with warty elevations. As the disease rapidly penetrates the stroma, it is rarely recognized in the early stages.

In women with a narrow os externum the canal may be dilated by the neoplasm, as in cervical abortions. Where laceration and ectropium coexist it is not easy to distinguish a cervical cancer from one of the portio.

Fig. 194.

Carcinoma of Cervix, with formation of cavity (Ruge and Veit).

In cancer derived from cervical glands the latter may proliferate to an enormous extent, and traverse the cervix to the borders of the portio vaginalis, to the uterus, and outward to the peritoneum. The epithelium of the glands retains its cylindrical form. The extension results

from a branching process by means of which the stroma is destroyed. This form is comparable to the malignant adenoma of the body. More frequently the multiplied glands retain their lumina, and the proliferating epithelia finally form large cancer-nests.

In a third variety the cylindrical epithelium of the cervical mucous membrane occurs in many layers, forming an epidermoidal stratum, from which epithelial offshoots push into the underlying tissues and destroy the stroma. In this way thick massive epithelial trabeculæ are formed, in which epithelial "pearls" are found as in cutaneous forms of cancer.[1]

The Invasion of Neighboring Organs.—The further progress of the disease is the necessary consequence of the intimate connection of the uterus with the contiguous organs. We have already seen how it may extend from the cervical mucous membrane to the muscular structure of the cervix, and upward to the body of the uterus, and how the mucous membrane of the vagina becomes covered with secondary granulations. Generally, in post-mortem examinations the limits between cervix and vagina can only be determined by their relations to the bladder and rectum. The cellular tissue around the uterus and between the folds of the broad ligaments becomes invaded by gland-like tubules or isolated granulations. Thence the disease spreads to the bladder and rectum, attacking successively the intermuscular and submucous connective tissue, and finally the mucous membrane. From the bladder it creeps upward to the apertures of the ureters. Sometimes both anterior and posterior culs-de-sac of the uterus become filled with cancerous deposits. The pelvic glands are always tumefied, and are frequently transformed into a mass like the diseased tissue of the primitive tumor. Single glands may attain the size of an apple, and a

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[1] Hofmeier in a statistical report classified the cases, so far as was practicable, in accordance with the primary seat of the disease. Of 812 cases, the portio was first affected in 236, the cervix in 181, and the body in 28 instances. The seat was undecided in 367 instances.

The average age in carcinoma of the portio was forty-two years: of the entire number (236), 7 had never borne children and 33 were primiparæ. The average age in carcinoma of the cervix was forty-seven years: of the entire number (181), 14 had never borne children and 23 were primiparæ. In carcinoma of the portio 17 were under thirty years of age, 84 under forty years, 34 under fifty years, and 1 under sixty years. In carcinoma of the cervix there were 3 under thirty years, 34 under forty years, 66 under fifty years, and 20 under sixty years. Thus, carcinoma of the cervix is shown to occur with greatest frequency in the later years of life and often many years after the climacteric.

In carcinoma of the body the average age was 54.5 years. 2 occurred between thirty and forty years, 3 between forty and fifty years, 15 between fifty and sixty years, and 6 between sixty and seventy years. Of the 28 cases of cancer of the body, 6, or 21 per cent., were nulliparæ, while of 417 cases of cancer of the portio and cervix combined, 11, or 2.5 per cent. only, had never borne children ("Zur Statistik der Gebärmutter Krebs," *Zeitschr. f. Gebürtsk. u. Gynäk.*, vol. x. p. 276).

plexus may become the size of a man's fist. Sometimes the ovaries are involved, though it is difficult in microscopic examination to determine whether a degenerated tumor glued to the postero-lateral surface of the uterus is an ovary or a lymphatic gland. Wagner[1] found the ovaries reported as affected in 22 cases out of 171, in most of which the degeneration was propagated from the fundus uteri. From an early period of the malady there is marked pelvic peritonitis, with formation and organization of false membranes. In this way adhesions form between the Fallopian tubes and the adjacent organs, and the whole pelvic contents become at last reduced to a nearly solid, immovable mass.

ETIOLOGY.—The etiology of uterine cancer is obscure. The most important of the conditions which favor its occurrence are age, inheritance, childbearing, and erosions.

Gusserow[2] collected 2265 cases from various sources. Of these, two occurred prior to the twentieth year. Of the others,

81 cases occurred between the 20th and 30th years.
476 "   "   "   30th and 40th   "
771 "   "   "   40th and 50th   "
600 "   "   "   50th and 60th   "
258 "   "   "   60th and 70th   "
82 "   "   after 70 years.

Thus the largest number occurred at the climacteric period. In more than three-fourths of the cases the disease appeared after the fortieth year. It is not entirely clear whether age creates conditions which predispose to the development of uterine cancer, or whether the statistical frequency of uterine cancer during middle and advanced life is the result of the diminished resistance afforded by the tissues.[3]

In addition to the two cases which occurred in women under twenty years, Eckardt[4] has recently reported a third instance in a young girl nineteen years of age.

The influence of heredity in creating a predisposition to cancerous affections of the womb is still a subject concerning which marked differences of opinion exist. Paget, indeed, believed that in as many as one case in three the disease was traceable to an ancestral taint. Gusserow collected from different authors 1028 cases of uterine cancer, in 79 of which, or in 7.6 per cent., some family relative was reported to have died of a cancerous affection. Barker reported 487 cases from his private practice, in 36, or 7.3 per cent., of which a member of the family presumably had had cancer. But in Gusserow's collection 9 were contributed by himself, and of these he expresses some doubt as to the correctness of the histories given. The evidence of patients, as

[1] *Der Gebärmutter Krebs*, p. 68.
[2] *Billroth's Handbuch der Frauenkrankheiten*, 4th part, p. 186.
[3] Vide note, p. 608.   [4] Eckardt: *Arch. f. Gynäk.*, vol. xxx. p. 471.

a rule, consists of little more than the statement that they had been told that an ancestor had died of the disease. The value of such testimony may perhaps be estimated by the fact that in a New England village of 1500 inhabitants, where I have spent many summers, a quack-doctor supported himself and family for years by the treatment of pretended cancer which occurred in that small community. Beigel found only 2 cases of possible transmission in 88 patients with uterine cancer.

There is no doubt that the frequency of cases referable to inheritance diminishes with more exact diagnosis and more critical methods of investigation. Still, many remarkable coincidences of undoubted authenticity exist. Of these, one of the most striking has been reported by Broca,[1] where a mother died of cancer of the breast. Of her four daughters, two died of cancer of the liver and two of cancer of the breast. Of the third generation ten members died of cancer. Hardly less extraordinary is the history of a family in the clientèle of Dr. Barker, where eight members died of cancer, though there was no history of the disease in any of the immediate ancestors.

The influence of childbearing in creating a predisposition to cancerous affections of the uterus is apparently very considerable. In 580 cases collected by Gusserow[2] the total number of children at term was 3025, or an average of 5.1 to each female—an average somewhat in excess of ordinary fertility. Hofmeier[3] reports, from material gathered from the Berlin Polyclinic and Schroeder's private practice from April 1, 1876, to Jan. 1, 1884, that of 849 women who had borne children, 106 had had one child, 667 had an average of 5.8 pregnancies, and 76 had over 10 pregnancies.

In a considerable proportion of cases the disease develops soon after childbirth. West found this to occur in 11.3 per cent. of his cases, and Gusserow states that in 48 cases observed by him, 9 occurred within a year of confinement. Hofmeier calls attention to the exceptional malignity of carcinoma developing subsequent to childbed, which he attributes to the development of the lymphatics and the succulence of the connective tissue.

In Hofmeier's statistics of 812 women, 39 had never borne children. Emmet,[4] however, goes so far as to assert that he had never known a woman to have any form of epithelial cancer of the uterus unless she had at some time been impregnated. I can recall a case of cauliflower excrescence in an elderly unmarried woman who presented all the anatomical evidences of intact virginity. In certain similar cases, however, W. A. Freund has shown that the uterine disease was secondary to cancer of the rectum or bladder.

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[1] *Traité des Tumeurs*, vol. i. p. 151 (*vide* Beigel, p. 511). [2] *Loc. cit.*, p. 191.
[3] " Zur Statistik der Gebärmutter Krebs," *Zeitschr. f. Geb. und Gynäk.*, vol. x. p. 272.
[4] *Principles and Practice of Gynecology*, p. 496.

The descriptions of Ruge and Veit give special prominence to the importance of erosions as a source of local irritation, and frequently as the starting-point of malignant uterine growths. Indeed, it is not always easy to determine in the papillary form, without microscopic examination, whether the lesion is benign or whether there exists already the primary stage of a cancerous affection. Emmet lays great stress upon the importance as an etiological factor of cervical lacerations—an importance doubtless due to the associated catarrhs and to secondary changes in the adjacent mucous membranes.

In carcinoma of the body Ruge and Veit found there was no statistical relation to either endometritis, retro-displacements, or childbearing. A very striking coincidence was found to exist with late cases of menstruation, referable in the opinion of the authors to some source of irritation, which by maintaining a hyperæmic condition produced chronic alterations of the mucous membrane and in predisposed individuals led to malignant disease.

SYMPTOMS.—So long as the carcinomatous affection is limited to the vaginal portion no symptoms occur previous to ulceration. Indeed, in many cases, even after the occurrence of degenerative changes, the health of the patient continues excellent, so that commonly when the disease is first detected extensive destruction of the portio and vagina has already taken place, and the time for effective local treatment is past. Gusserow mentions as a rare exception the invasion of the cellular tissue by cancerous nodules forming elevations in Douglas' cul-de-sac, which cause peritoneal pains in advance of ulceration.

In most instances uterine hemorrhage is the earliest symptom to which the attention of the patient is attracted ; but occurring, at the outset, where the woman has not passed the climacteric, in most cases at or near the menstrual period, it is apt to be regarded as simple menorrhagia. After the climacteric the occasional recurrence of uterine hemorrhage, so long as it is not very severe, is too often regarded as a natural incident of the change of life. In these early stages hemorrhage must be mainly attributed to disturbances in the circulation of the affected part.

Sometimes preceding, often accompanying, and invariably following hemorrhage, we find certain leucorrhœal discharges, the cause of which, as well as that of the later hemorrhages, is to be found in the processes of ulceration. These consist at the outset in the exfoliation of the surface epithelium and the layer of indifferent tissue that covers the morbid process. Certain of the cells undergo degenerative changes. Frequently they become spherical and are filled with granulations, or a vesicular condition may be induced by the formation of cavities in their midst, or they may contain several nuclei or even fully-developed cells. Once these forms were regarded as specific, and were therefore termed

cancer-cells ; but they are met with under physiological conditions in the bladder and placenta. Finally, the cells in the gland-tubules are set at liberty, and form with the transuded serum a whitish liquid, sometimes termed the cancer-juice. As the more superficial constituents of the gland-like bodies dissolve away, the thin connective partitions remain, and float when water is poured upon them in the form of delicate vascular fringes, or when they are thicker and the vessels of considerable size they may resemble the granulations of a wound. Corresponding to these changes the discharges are inodorous, sero-purulent, and of moderate extent. Menstruation is profuse, or more rarely irregular hemorrhages occur only after coitus, or where constipation exists, or after bodily exertion.

In interstitial forms a softening may result from an increase in the cells, followed by a giving way of the connective-tissue partitions, so that two or three contiguous alveoli communicate together. These finally open and ulceration of the neoplasm begins.

The various forms of ulceration are associated with papillary granulations or fungosities composed of dilated vessels with thinned walls, which rupture with the greatest facility. These terminate sometimes in loops, sometimes in club-shaped extremities. They are subject to a series of alterations, beginning with the multiplication of their nuclei, by means of which their walls are thickened and their central cavity strictured or obliterated ; this is followed by arrest of circulation, and ends in fatty molecular disintegration. Similar changes take place in the small vessels and capillaries within the tumor, and from the obliteration of the veins there result abolition of return circulation and augmented pressure from behind, which unquestionably is one cause of rupture of the vessels and hemorrhage. Sometimes in larger arteries the tunica adventitia may degenerate, the circulation continuing, but with more or less obstruction. At length a point is reached when the inner coat can no longer resist the shock of the blood-wave, and the blood escapes, giving rise, if the point of perforation be near the surface, to considerable hemorrhage.

Another result of these circulatory disturbances is sphacelation of the tissues deprived of the blood requisite for their nutrition. If one of the large veins be obliterated a considerable portion of the tumor mortifies. The chemical and molecular decomposition of the tumor is still further increased by liquids from various sources that stagnate in the vaginal cul-de-sac, so that almost all old ulcerated epithelial growths offer more or less extended portions in a state of moist gangrene, to which the peculiar odor of the discharges is due. The destructive action may extend to the body of the uterus, until only a rudiment of the fundus remains ; communications may take place between the vagina and rectum on the one hand, and between the vagina and bladder on

the other; and, finally, the lymph-glands, which by this time have become adherent to the surrounding tissues and to one another, may soften and ulcerate, and thus a large portion of the pelvic cavity may become converted into a vast cloaca, furnishing an ichorous, stinking, sanguinolent discharge.

From the occurrence of the first symptoms to the death of the patient the interval does not usually, in cancer of the cervix and vaginal portion, exceed one year and a half.

It is a curious fact, considering the abundant losses of blood associated with uterine cancer, that death from hemorrhage is almost never observed.

In carcinoma of the body the most striking symptom is hemorrhage. It occurs at the end of menstrual life or years after the climacteric. It increases in intensity with the progress of the disease. Often mucous discharges precede the hemorrhage or fill up the intervals between them.

A stinking odor is not distinctive. It signifies tissue undergoing putrefaction within a cavity possessed of rigid, inelastic walls. No odor is of necessity observable before the destructive changes have begun and so long as the muscular structures are of normal thickness.

The pains are mostly of a paroxysmal nature. They are relieved by the expulsion of portions of the growth, and may even be made to disappear by vigorous scraping with the curette. The cachexia is often late in making its appearance, and the course of the disease is relatively slow. Bladder troubles, uræmia, and rectal compression are not indeed rare, but ordinarily the primary symptoms first bring the patient to the physician.

The duration of the disease from the time of the first observed symptoms without palliative treatment is at least two years.

Sharp lancinating pains are usually considered as pathognomonic of uterine cancer, yet this symptom belongs generally to an advanced stage of the disease. So far as it alone is concerned, the morbid process may assume formidable proportions before it awakens the attention of either patient or physician. Pain is rare while the disease is limited to the cervix, and only then when inflammatory irritation is present in the neighborhood of the morbid growth. The peculiar dolorous sensations associated with uterine cancer develop chiefly when the pelvic cellular tissue is invaded. It is the cellulitis that causes the suffering experienced in urination and defecation. When rapid gangrenous destruction of the growth occurs, often a mitigation of suffering ensues. Pains at an early period are due to peritoneal irritation or to local peritonitis. In advanced stages peritonitis is rarely absent. When the cancerous infiltration invades the uterus pains ensue, consequent, it is presumed,

upon injuries and alterations in the uterine nerves. Cornil,[1] who has made a special study of the nerve-lesions, states they are primarily seated in the neurilemma and perinerve, the nerve-tubes being only secondarily affected. They may present in the uterus the following varieties: 1. The neurilemma is transformed into tissue similar to that of the epithelial neoplasm in which it is imbedded, and from which it cannot be enucleated; 2. The nerve-trunks can be easily separated from the neoplasm with which it has formed no attachments. It is then found to present in its course fusiform or spherical enlargements, due to hypertrophy and hypergenesis of the neurilemma. Of the two varieties, the latter is the most common. In both, when the neurilemma is extensively affected, the medullary substance of a portion of the nerve-tubes is always found to have undergone granular degeneration, but the degeneration was never anything but partial. This preservation of the larger number of nerve-tubes explains the symptomatology of these tumors, which occasion pain and not paralysis. In certain instances, it is true, the power of locomotion has been found to some extent impaired, but this was where there was accompanying œdema of the limbs, and was not due to the lesions of the nerves alone. Patients, it may be mentioned, sometimes complain of subjective sensations of heat or cold in the painful member, while in reality the temperature does not differ from that of the healthy limb.

In the progress of uterine cancer certain accidents are liable to occur which are only indirectly the results of disease, but which are yet of primary importance, not only as regards symptoms, but as frequently involving life itself.

Thus the compression of an artery by the growing tumor may give rise to thrombi. Venous thrombi are, however, much more frequent than arterial, and are found in about a third of the fatal cases. They may be due to compression, or large veins may be perforated, and a portion of the tumor, coming into direct contact with the blood, may cause coagulation. In this way veins may be obliterated, but the larger the vein the longer the circulation continues, and, as the ingrowths are soft, they become pedicled by the washing of the blood in the calibre of the vessel. They become augmented in size by the deposit of coagula about them. Thrombi further owe their origin to the general marasmus almost always present in the last stage of cancer, and to the weakened action of the heart, resulting partly from fatty degeneration and partly from the frequent recurrence of profuse hemorrhages. Venous thrombi may involve not only the utero-vaginal and vesical plexuses, but may extend to the crural and iliac veins. As a consequence of the stoppage of the vessels there may result œdema of one or both extrem-

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[1] "Sur la Production des Tumeurs epithel. dans les Nerfs," *Robin's Journal*, 1864, p. 185.

ities, usually of moderate intensity. This is not, however, the only cause of œdema, as very many cases seem traceable to the hydræmic condition of the blood. Among the more remote consequences is the migration of emboli to distant parts, of which the lungs are the most frequent point of lodgment, when they may give rise to pulmonary œdema and to lobular and lobar pneumonia.

Peritonitis rarely fails as a complication. It is usually of a chronic character, and is followed by the formation of adhesions, which frequently act as a conservative provision, protecting the peritoneum from perforation. Owing to the contiguity of the diseased structures, peritonitis is most common in the cul-de-sac of Douglas and vicinity, but it may arise from softening and destructive changes in the secondary formation in the coats of the bladder, rectum, Fallopian tubes, and in the pelvic glands, or it may result from consecutive diseases of the same tissues not of a cancerous nature. Acute peritonitis seldom occurs as secondary to the chronic form, but results from the passage of septic products through the tubes from perforation of the uterine walls or from rupture of abscesses into the peritoneal cavity. Either of these occurrences is necessarily followed by speedy death.

The invasion of the vagina is frequently attended with inflammation of relatively healthy portions, with swelling of the vulva, and sometimes with intense pruritus. The extension of the inflammation to the bladder and rectum gives rise at an early period to cystitis and catarrhal affections of the lower bowel, with painful urination and defecation and enlargement of the hemorrhoidal veins. Blau found in 93 cases of cancer observed in the Pathological Institute of Berlin 10 cases of pyelo-nephritis.

Cancerous invasion of the bladder by extension from the vagina and the pelvic connective tissue was observed by Gusserow 128 times in 311 cases, and in 56 of these the invasion was followed by the formation of fistulæ. In many instances there were associated not only the symptoms of catarrh of the bladder, but deep-seated diphtheritic inflammations and ulceration of the vesical mucous membrane.

Partial and complete occlusion of the ureters, due to pressure exerted by cicatricial thickening of the connective tissue, to cancerous infiltration, and in rare instances to extension of cancerous products to the ureters, have been frequently remarked. As a secondary result, dilatation of the ureters, the pelvis, and calyces of the kidneys, with varying degrees of hydro-nephrosis, are in advance stages of uterine cancer of common occurrence. Blau in the report already referred to found this condition in 57 of the 93 cases he examined. Seyfert was accustomed to assert that uræmia from this source was the ordinary cause of death in late stages of the disease.

Sometimes the kidneys are atrophied, but generally they are pale,

globular, anæmic, and semi-transparent from distension by retained excretory products. In rare cases we may find albuminous nephritis or pyelo-nephritis, with the pelvis and calyces filled with thick, cheesy pus. It is a singular fact that in fatal cases of uræmia, uræmic convulsions, even in cases of total suppression, are rarely present. Cornil[1] remarks : " With these obstructions to the excretion of urine we expected to find uræmic symptoms to be manifested, but they were not. Although the attention of M. Charcot and myself was fixed upon this point, we saw neither the epileptiform convulsions nor the coma peculiar to uræmic poisoning." Sometimes the ureters are relieved from pressure, and the anuria ceases after the destruction of the trigonum vesicæ and the formation of a vesico-vaginal fistula.

Gusserow reports that in 282 cases the rectum was implicated 53 times, with 37 recto-vaginal fistulæ.

Metastases to remote regions are extremely rare, but they occur in the peritoneum, mesenteric glands, kidneys, lungs, liver, pleuræ, and stomach.

Disturbances of digestion occur as early symptoms. With obstinate constipation there is usually chronic catarrh of the stomach, anorexia, and not infrequently persistent vomiting. The latter symptom may be associated with the metastases referred to, with uræmia, or with chronic peritonitis. Gusserow lays stress upon the atmosphere which surrounds the patient as a prominent source of stomach disturbances.

In the term cachexia we have an expression for the general condition of the body to which the disease leads. Hemorrhage induces anæmia and hydræmia, the products of decomposition are absorbed into the system, the processes of assimilation and nutrition are impaired by the deteriorated condition of the blood, and as a result the patient becomes thin, wan, yellow, and wrinkled. As these consequences do not occur so long as the tumor remains local, we are justified in assuming that the deleterious influence upon the organism is due not to any specific infecting property of the tumor itself, but to the necrotic changes it undergoes.

Marasmus is the most frequent occasion of the lethal ending ; thrombosis of the veins, dysentery, bed-sores, and diphtheritic inflammations of the bladder and the rectum frequently, however, contributing to the fatal result. Purulent peritonitis is another common cause of death. In 93 cases already referred to which were reported by Blau, 48 deaths resulted from exhaustion, 27 from peritonitis, 11 from pneumonia, 3 from pleurisy, and 3 from pulmonary emboli ;. but the statistics of Blau were based upon observations made upon cancer in different organs of the body, and are not confined to the malignant affection of the uterus. In Säxinger's report from Seyfert's clinic of 62 fatal

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[1] *Loc. cit.*, p. 647 *et seq.*

cases of uterine cancer, the following additional causes of death are given—viz. 9 from pyæmia, 5 from amyloid degeneration of the kidneys, 3 from œdema of the lungs, 3 from dysentery, and 28 from uræmia.

In cancer of the body of the uterus the hemorrhages are the most conspicuous symptom. They occur commonly at the end of menstrual life or years after the menopause. At first they are often preceded by mucous discharges and possess an intermittent character.

If the uterine cavity is enlarged and the cervical canal is closed, the retention of disintegrated portions of the growth may give rise to a stinking discharge, but when the walls are of normal thickness and the new formation is superficial, no odor may be perceptible.

In advanced stages of the disease intermittent pains due to uterine contractions are common when the growth fills the uterine cavity. The periodic character of the pains is partly explained by the repose which follows the expulsion of the diseased tissue. Intermittent pains are usually absent in cases where the disease is nodular and tends to growth in the direction of the periphery of the organ.

Cachexia is a late symptom in cancer of the uterine body. As in cervical cancer, uræmia, bladder troubles, and symptoms of rectal compression occur, though perhaps with lessened frequency.

DIAGNOSIS.—The success of surgical measures for the radical cure of cancer has rendered it a matter of great importance to recognize the disease in its early stages while operative measures are still practicable—*i. e.* before the invasion of the connective tissue adjacent to the uterus. At the present time all the older signs by which it was thought practicable to distinguish prior to ulceration benign from malignant forms of disease are no longer regarded as conclusive, and the microscope alone is relied upon to determine the nature of suspicious growths. Since this has become the rule, cases of cure of uterine cancer consequent upon the removal of the vaginal portion, formerly so common, have ceased to be reported. A hard, swollen, nodular condition of the cervix, associated with menorrhagia or metrorrhagia, is not necessarily diagnostic of cancer. It should, however, prompt to the excision of a sufficient portion of the diseased tissue to render a satisfactory microscopical examination available. Intracervical nodules are difficult to distinguish from old cervical catarrhs. Schroeder declares that in cases of great hypertrophy of the portio the presence of the ovules of Naboth are of good omen.

It is extremely rare, however, for the attention of physicians to be called to the existence of cervical cancer previous to the occurrence of ulceration. A papillary outgrowth seated upon a broad base is cancerous. In the case of a small ulcer with papillary projections the diagnosis is sometimes uncertain. Stratz, however, insists that in the

malignant form the borders of the ulcer are sharply defined, the surface has a granular appearance; and he lays great stress on a yellowish tint and on glistening whitish-yellow elevations as characteristic. Schroeder lays stress on the presence of a zone of follicles encircling a papillary ulcer as an indication of benignancy, but it is to be borne in mind that every papillary ulcer has a tendency to become cancerous.

In advanced stages the diagnosis is easy. The hard surface, the indurated borders, the deep cervical excavations, or the proliferated masses springing from the base, the brittle character of the growth, the necrotic shreds, the stinking ichorous discharges, the associated hemorrhages, the losses of vaginal substance, the infiltration of the pelvic connective tissue, the fixation of the uterus, and the general marasmus, are sufficiently conclusive. Only a superficial examination would confound these conditions with those which exist in sloughing fibroids and diphtheritic ulcers.

In the so-called cauliflower growths excision and the resort to the microscope are essential for the diagnosis, though a benign papilloma assuming the cauliflower form is of altogether exceptional occurrence. When symptoms point to the probable existence of carcinoma of the body, the curette should be resorted to and the existence of a growth determined. The scrapings should then be tested by the microscope.

TREATMENT.—The treatment of uterine cancer consists in the employment of curative or palliative measures. The aim of treatment should of course be the complete freeing of the patient from the frightful malady with which she is afflicted. Cure can only be effected by the removal of every particle of diseased tissue. Whether this can best be accomplished by the extirpation of the entire uterus, or whether in selected cases partial ablation furnishes a safer and at the same time an equally satisfactory procedure, is a matter still *sub judice.*

The first case of vaginal hysterectomy for uterine cancer was performed by Sauter of Constance in 1822.[1] His method consisted in the separation of the cervix from the vagina by a circular incision, the opening of the anterior cul-de-sac, the separation of the uterus from the broad ligaments and tubes, the forcible anteversion of the uterus, and finally the division of the posterior attachments. The patient lost a pound and a half of blood, but made a complete recovery. Death from œdema of the lungs occurred four months later.

Blundell in 1828 opened first the posterior cul-de-sac, and then the anterior vaginal vault. Next he retroverted the uterus with a double hook, and dragged the fundus down to the coccyx. The operation was completed by the separation of the lateral uterine attachments. The

[1] According to Hegar and Kaltenbach, the operations of Marshall (1783) and of Langenbeck (1813) were performed upon the prolapsed uterus, and the diagnosis of cancer was doubtful.

patient died at the end of the year of carcinomatous stenosis of the rectum.

Récamier in 1829 modified the operation of Sauter by dividing the upper two-thirds of the broad ligaments only, while to the lower third, including the uterine artery, he applied ligatures. At the end of thirty-four days the patient was pronounced cured.

In 1850, Prof. Paul F. Eve excised a carcinomatous uterus from a negress twenty-eight years of age. He ligated the left uterine artery, which bled profusely. A solution of sulphate of zinc was applied to restrain further hemorrhage, which had been considerable. The patient returned to her home on the seventeenth day. The disease recurred, and the patient died of hemorrhage three months and a week after the operation.[1]

Hegar likewise refers to successes obtained by Kieter (1848) and by Hennig, but as a set-off to these rare instances of recovery there were upward of thirty operations in which death speedily followed from collapse, hemorrhage, or peritonitis.

In 1878, Wilhelm Alexander Freund[2] published a successful case of uterine extirpation for cancer made from above through an incision in the abdominal walls. The operation was performed on the 30th of January. After carefully washing the uterine cavity with a 10 per cent. solution of carbolic acid, and emptying the bladder and rectum, an incision was made through the linea alba, extending from the symphysis pubis to three fingers' breadth below the navel; the intestines were lifted from the pelvic cavity, and, wrapped in a carbolized towel, were laid upon the abdominal walls; a ligature was passed through the fundus, by means of which the uterus was drawn upward; three ligatures were then passed through the broad ligaments upon each side, the first penetrating the substance of the tube and that of the ligamentum ovarii; the second, the ligamentum ovarii and the round ligament; the third one, the round ligament through the vagina, and returning so as to include the base of the broad ligament. After tying the ligatures tightly the uterus was removed by first separating the cervix from the bladder, then opening the cul-de-sac of Douglas, and finally dividing the broad ligaments next to the uterus. The threads were then passed through the aperture into the vagina and drawn downward. As this was done the pelvic peritoneal folds above were brought into contact, and were closed by a series of button sutures. Freund's great merit consisted in the systematic application of ligatures to control hemorrhage. But the method of Freund in practice did not prove successful. In 1881, Hegar and Kaltenbach published a summary of

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[1] A. P. Dudley: "Vaginal Hysterectomy in America," *N. Y. Med. Journ.*, July 9 and 16, 1887.

[2] *Volkmannsche Sammlung*, No. 133.

results to that time. In 93 operations there were 63 deaths. But meanwhile Schroeder was practising the high excision of the cervix after detaching the cervix from the vagina and bladder and tying the uterine arteries in the broad ligaments. Rydigier proposed in 1880 to combine this method with that of Freund. Bardenheuer carried this suggestion into practice, and, in place of closing the aperture left after removal of the uterus, introduced a drainage-tube through the vagina. He likewise abandoned the ligatures *en masse*, substituting for them special ligatures to each bleeding vessel which was exposed in dividing the broad ligaments. Of 12 patients operated upon, 9 recovered. Thus, step by step, the way was prepared for the vaginal method of extirpation, the success of which has finally led to the abandonment of the abdominal operation.

The pioneer in the new path which had thus been marked out through the labors of many workers in the same field was Czerny. On the 12th of August, 1878, the Heidelberg surgeon removed the uterus through the vagina, applying ligatures to the severed vessels as a preventive measure against hemorrhage. His patient recovered. The perfecting of the procedure we owe to Schroeder, Olshausen, Leopold, Martin, Freund, and others in Germany. In our own country the work has been followed up with special success by Fenger, Polk, Cushing, Lane of San Francisco, and Bernays of St. Louis.

The extirpation of the uterus *per vaginam* is only indicated in the early stages of cancerous disease. To be of avail it is necessary that the uterus should be movable and the parametria free. It is of great advantage if the cervix can be drawn down by volsella to the pelvic floor. To determine these points the patient should be examined under an anæsthetic after preliminary evacuation of the bowels. Shauta mentions as a contraindication an infiltration of the pelvic cellular tissue around the uterine arteries, forming a firm, rigid cord recognizable by the finger upon rectal exploration. The non-observance of these rules can only be followed by an enormous increase in the mortality rates, and result in bringing the operation into disrepute, owing to a speedy recurrence of the disease.

Preliminary treatment consists in the administration of bismuth and laxatives for several days previous to the operation to counteract flatulence and to render the abdomen soft and compressible; in full baths to promote activity of the skin; and in thorough disinfection of the vagina by irrigations with corrosive-sublimate solution in the proportion of 1 : 1000.

At the time of operation the external genitals should be shaved and cleansed with soap, ether, and bichloride solution. Leopold recommends the introduction of a tampon into the anus. Necrosed tissue and pus-collections should be scraped away with the curette, and a 5

per cent. solution of carbolic acid should be thoroughly applied to the morbid growth and to the folds of the vagina.

Amputation of the cervix is only advisable when the size of the tumor interferes with the field of operation. Leopold, however, recommends scooping away the diseased tissue with the sharp spoon from the vaginal portion at the time of operation, introducing ligatures if necessary afterward to restrain bleeding, and employing means to carefully disinfect the utero-vaginal canal. Tauffer, after removing the cervix, curetting diseased points, and employing the actual cautery, applies chromic acid and chloride-of-zinc solutions to the stump for ten or twelve days previous to the operation, until a clean surface is produced. The success of other operators who warn against such measures, owing to the possibility of promoting the extension of the disease by opening up the lymphatics, is evidence, however, that preliminary amputation is not indispensable.

Operation.—In the performance of the operation the patient is usually placed upon the back with the hips everted, or in the lithotomy position. In either case the thighs should be brought well over the edge of the table.

Short, broad specula, modelled after those of Sims or Simon, are employed to expose the vaginal vault. Long specula, by preventing the descent of the uterus, increase the difficulty of the operation. Usually two specula, one to hold up the anterior and one to depress the posterior vaginal wall, suffice. Sometimes during the progress of the operation it has been found convenient to substitute for the latter the fingers of an experienced assistant. Exceptionally, blades for the lateral walls are required, or forceps may be employed to draw the labia outward. Fritsch has perfected a speculum for the anterior wall by means of which the field of operation is continuously irrigated with a 1 per cent. solution of carbolic acid.

A description of the operation is rendered difficult by differences in details in the practice of surgeons of the largest experience and reputation. When the parts have been properly exposed the vaginal portion should be seized with volsella forceps, and a circular incision made through the vaginal attachments. Usually, the incision is completed in two separate acts. Thus, either the anterior lip is seized, the uterus drawn forcibly downward, and a semicircular cut made in front above the seat of disease, to enable the operator to proceed at once to the detachment of the bladder from the uterus, or the volsella are made to seize the posterior lip, the cervix is drawn upward, and a semicircular cut is made first behind at the vaginal attachment with the intent of at once reaching the cul-de-sac of Douglas. Fritsch, on the other hand, begins with lateral incisions and ligates at the outset the vessels in the base of the broad ligaments. The advantages of this method, he

maintains, are the arrest of all hemorrhage previous to opening the peritoneum, the increased mobility imparted to the uterus, and the possibility of arresting the operation in time in case the parametria are found to be invaded and total extirpation therefore purposeless. Martin pronounces these trifling variations in the technique to be immaterial.

From the first employment of the knife to the opening of the peritoneal cavity irrigation should be either continuous or at frequent intervals.

The detachment of the cervix from the bladder-wall is accomplished by the fingers while the vaginal portion is drawn downward and backward. Pains should be taken at the outset to find the intercellular layer. The separation is usually not difficult. It may become so if the cellular tissue is found to be invaded by cancerous nodules or if the fingers are kept too close to the uterus, so that they make their way beneath the external muscular uterine layer. The extent of the connection between the bladder and the cervix varies greatly in different cases. In some instances, according to Martin, it does not exceed half an inch; in others it may extend halfway upward over the body of the uterus. The opening effected should not be too narrow. By detaching the bladder for a sufficient extent laterally there is less risk of the ureters becoming involved in the ligatures applied to the broad ligaments. There need be no difficulty in recognizing the peritoneum after the bladder detachment has been completed. In cases of doubt its glistening surface can be brought into view by lifting the bladder surface upward. Before proceeding farther all hemorrhage should be checked. Martin accomplishes this by silk ligatures passed from the vaginal wall near the cut surface around the bleeding tissue and returned to the vagina, so that when tied they run parallel to the cut border. Sometimes the hemorrhage is so slight that a stream of hot water suffices for its arrest.

The opening into the cul-de-sac of Douglas is usually easily effected. The cervix is drawn upward, and the incision already referred to is made at the vaginal insertion. In some instances the peritoneal sac is at once laid open. In others it is necessary to detach tissue of considerable thickness. If in the latter case there is troublesome hemorrhage, it should be controlled by interrupted sutures passed around the bleeding mass from the vaginal surface parallel to the vaginal cut. The peritoneum presents the appearance of a delicate glistening membrane. This should be incised and the opening enlarged. Martin at this point passes his finger into the cul-de-sac and presses the peritoneum downward. Under the guidance of the finger he stitches with curved needles the peritoneum to the vagina with sutures introduced parallel to the cut surface. Leopold employs sutures at the angles of the wound

only, guiding the needle serving for their introduction to and across the cul-de-sac of Douglas, returning the ends to the vagina, so that when drawn upon they approximate the outer borders of the cut surface. To

FIG. 195.
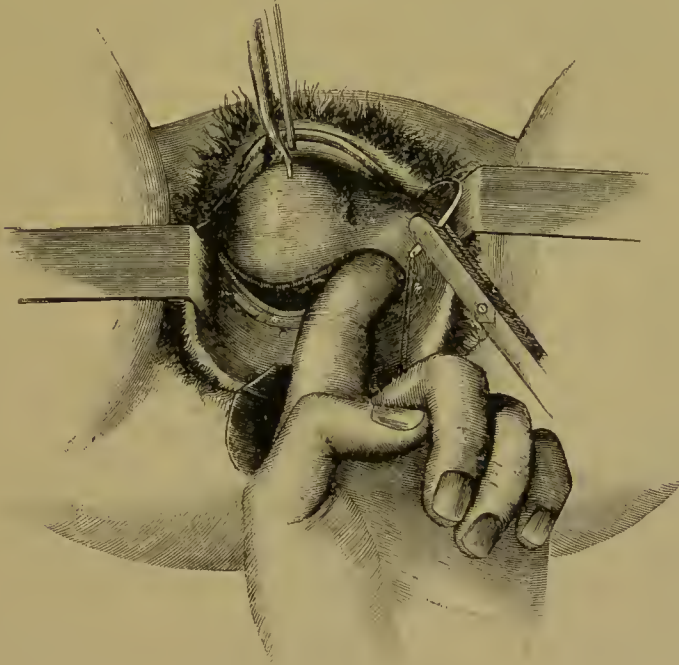
Sewing the Floor of the Pelvis (Martin's method).

prevent prolapse of the intestines a sponge the size of an English walnut, to which a silver wire has been attached, should be pushed up behind the uterus.

In this way, with the exception of the anterior peritoneal reflection, the uterus is separated front and rear. The speculum used to depress the perineum is next removed. An assistant draws the uterus strongly to the right side with volsella or with a ligature passed through the vaginal portion. The operator introduces the index finger of the left hand into Douglas' cul-de-sac and presses the left broad ligament from behind forward. The finger helps not only to bring the parts within easy reach, but serves as a guide to needles employed in the introduction of the lateral ligatures. These are intended to close the vessels in the base of the broad ligament, including the veins and the uterina with its branches. They should be of strong silk, and should be carried through the tissues by means of an aneurism-needle or a curved needle grasped by fine forceps. The first ligature should be inserted below near the uterus, and should be firmly tied. The ends should be left long. The tissue next to the uterus should be divided with scissors.

Then, still under the guidance of the finger, a second ligature is passed above the first, and the tied portion separated from the uterus. The amount of tissue included in each ligature should be small to ensure adequate compression. Thus step by step the vessels are secured from below upward until the point is reached where the folds of the broad ligaments are in immediate contact, and where, consequently, resistance to the finger ceases. For greater safety, each succeeding ligature should

Fig. 196.
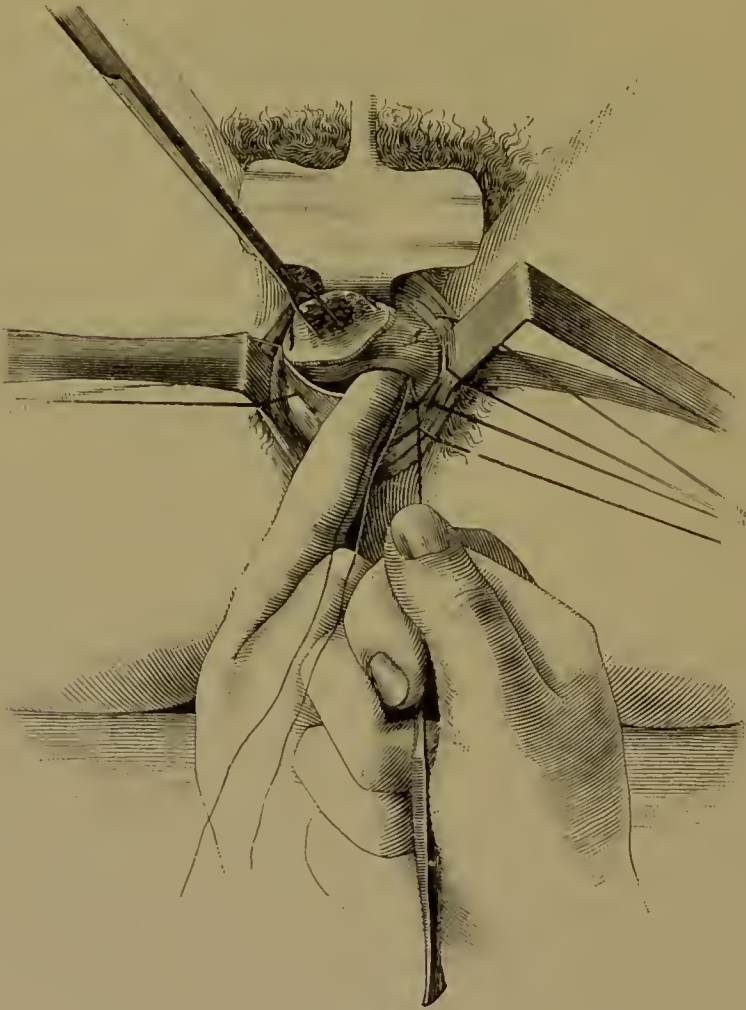
Leopold's Method.

partially overlap the territory of the one immediately below. Then the uterus should be drawn to the left, and the same process should be repeated on the right side. At this stage the uterus is detached front and rear, with the exception of the anterior peritoneal reflection, and is held at the sides by the tubes and upper folds of the broad ligaments only.

In its final removal Leopold prefers to leave the uterus *in situ,* and continues the lateral ligatures upward until the tubes, with the ovarian artery, have been tied and separated. Then he withdraws the sponge from the cul-de-sac of Douglas, which is recognizable by the silver wire attached to it, and inserts in its place a sponge upon a sponge-holder. Finally, a ligature is placed around the plica vesico-uterina, and the detachment is thus completed. Leopold reports but 3 deaths in 48 operations.

Martin's method differs from that of Leopold in that he prefers, after having detached the base of the broad ligaments upward to the sides of the uterine body, to retrovert the uterus and drag the fundus through the opening in the cul-de-sac of Douglas into the vagina. He then ligates the tubes and ovarian artery and the vessels of the pampiniform plexus in successive portions, and divides the tissues next to the uterus until the line of separation below has been reached.

The retroversion and dragging the fundus of the uterus into the vagina is often difficult. It is accomplished by drawing the cervix forward and depressing the hollow of the fornix. The posterior surface of the body is seized with bullet-forceps or the forceps of Muzeux, and as it comes into view other forceps are inserted nearer the fundus until the latter passes through the posterior opening. As regards further matters of detail, Martin, after tying the tubes and the portions of the broad ligaments lying near them, cuts away the uterus. There remains then below quite a thick mass of tissue to the sides of the uterus. These he ligates, but before severing them he stitches them to the vaginal wound. Before separating the peritoneal connection with the bladder he stitches the peritoneum to the vaginal wound in front.

Fritsch's method consists in first dividing, portion by portion, the parametria, and tying, as they are exposed, the vessels in the base of the broad ligament upon each side. He then opens into the anterior cul-de-sac and draws down the fundus of the uterus anteriorly into the vagina. A sponge is introduced in front to prevent descent of the omentum or intestines. After ligating and completing the separation of the broad ligaments he cuts away the posterior attachment and unites the peritoneum of Douglas' cul-de-sac to the vagina.

These three methods have been given in detail, partly because of the exceptional fame and experience of the reporters, but chiefly because they represent distinctive peculiarities in the operative procedure. Many other slight variations have been advised by others, but they require no special mention because they pertain to the individuality of the operator and are non-essential.

After the uterus has been withdrawn the ligatures should be made tense, and the tubes and ovaries, if accessible, should be ligated and removed. Every point in the severed tissues should be examined with

the utmost care, and all bleeding points should be tied. It is upon the pedantic observance of this rule that the subsequent safety of the patient depends.

Martin inserts a large rubber drainage-tube into the cul-de-sac of Douglas, the outer end of which he turns back into the vagina, and introduces a large compress of salicylated cotton to close the vaginal orifice. Others content themselves with sprinkling the stumps with iodoform, and, after cleansing the vagina of all blood, with filling the vaginal passage with iodoform gauze.

The subsequent treatment consists in complete mental and physical repose, in the maintenance of the pulse, and in the early administration, at short intervals, of small quantities of stimulants and fluid food. Urination is usually spontaneous. The bowels should be moved at the end of the week. The tampon of iodoform gauze should be withdrawn from the ninth to the tenth day. Only in cases of marked disturbance of temperature should earlier removal be resorted to. Usually, the patient behaves like a woman during the puerperal week. At the time the tampon is withdrawn the roof of the vagina is covered with red granulations. The stitches should be removed from time to time after preliminary irrigation of the vagina. The granulations should be carefully dressed with iodoform after each examination. The patient is usually able to sit up between the second and third weeks. Fritsch states that the average time of his patients in hospital was only two weeks. The safety of the woman after extirpation of the uterus is the result not of special therapeutical devices, but depends upon strict antisepsis and the careful control of hemorrhage at the time of operation.

In the vaginal extirpation of the uterus as commonly performed the chief difficulty encountered consists in the means employed to prevent hemorrhage from the broad ligament.

The prolongation of the operation which results from the use of ligatures is not without its effect upon the prognosis. In France, at the instance of Richelot, pressure-forceps, designed to grasp the entire width of the broad ligament, have been tried with satisfactory results. Doléris estimates that with the old method the deaths in France were in the proportion of one to three, whereas with forcipressure scarcely any but successes have been recorded. Doléris himself has recently devised a forceps-clamp, the blades of which are capable of separate introduction, and which lock after their adjustment in the manner of obstetrical forceps. One blade is somewhat longer than its fellow, and the extremity covers that of the latter in such a way that slipping downward after the two have been adjusted is rendered impossible. He reports two cases in which they were practically tested with entirely favorable results. He advises stripping the uterus from its attachments front and rear to as slight an extent as possible, and the appli-

cation of the clamps under the guidance of the finger as near to the uterus as possible. The blades should be removed at the end of thirty-six hours, by which time all danger of hemorrhage is over. Etheridge in

FIG. 197.
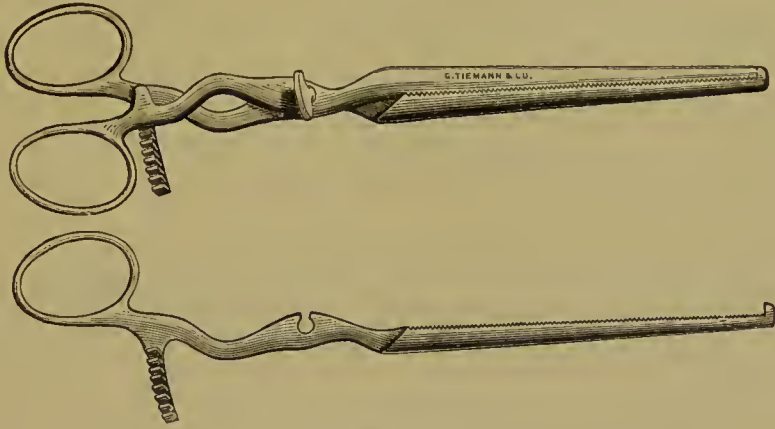
Doléris' Pressure-Forceps.

this country has recently indorsed forcipressure as a valuable resource in the performance of vaginal hysterectomy.

The legitimacy of total extirpation in the treatment of carcinoma uteri is no longer called in question. Martin, in a paper read before the gynecological section of the Ninth International Medical Congress, gives a list of 311 operations performed by six experts up to 1886, with 47 deaths, a mortality of 15.1 per cent. Dr. Sarah E. Post furnishes a table containing 722 operations, with 170 deaths, a mortality of 24 per cent. But in judging the true status of an operation we are not to be governed by the results obtained by aspirants who enter a new field without either proper equipment or training. The decision depends upon what is shown to be capable of accomplishment by those who undertake surgical work only after suitable anatomical preparation and forearmed against the difficulties to be encountered.

Vaginal Hysterectomy: Method of Prof. Polk of New York.—"The method which I have found best to pursue in operating in these cases is the following:

"A preliminary cleansing of the external parts is done by the assistant, soap and water and a 1 : 2000 solution of bichloride of mercury being used. The same assistant then cleanses the vagina and cervix with the same mercuric solution.

"I then seize the cervix with a volsellum forceps and drag down the uterus as far as it will readily come. Strong silk ligatures are then passed through the vaginal roof, one on each *side* of the cervix, the modified aneurism-needle devised by myself being used for that purpose. These ligatures are passed from before backward, and the point

of the needle carrying them is made to penetrate as high as the level of the internal os, if possible, before giving it the backward sweep. In this way the lower branches of the uterine artery, and sometimes the main artery itself, are secured. These ligatures are then firmly tied and cut short. It may be said that this ligation is the only one which is liable to involve the ureters. (If, however, the ligatures are entered at the front, inside of the well-known region of the ureters, and are then passed backward, as I have described, these canals will never be

Fig. 198.
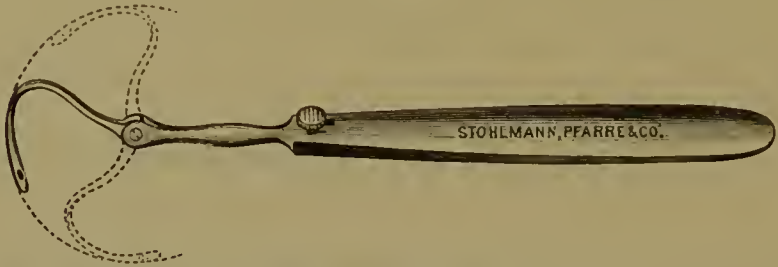
Prof. Polk's Needle, with joint permitting change of direction, for introducing sutures into the broad ligaments.

injured; they are well removed from the postero-lateral regions of the uterus.)

"A free incision is next made through the vaginal roof inside the ligatures upon both sides; the finger is introduced, and as much of the cervix is enucleated as may be without entering the peritoneal cavity. The vaginal wall is next cut away from the cervix anteriorly and posteriorly, and the cervix cut off as high up as the enucleation has been carried. The object of this amputation is to get rid of all the septic tissue, or as much of it as is possible, before opening the peritoneal cavity. It serves the additional purpose of clearing the field, so that even in a case where the disease is confined to the body I should do it, unless I should find that by so doing I would open into the ulcerating cavity of the organ.

"The stump of the uterus is then seized with the volsellum and continuous traction maintained as before. I now cleanse the vaginal stump and adjacent tissues with the solution of bichloride of mercury (1 : 2000), as before, submitting my own hands, and especially my nails, together with those of my assistants, to the same agent. All sponges and instruments which may have been in use up to this time are laid aside and fresh ones substituted. All this is done quickly, the necessary appliances being at hand.

"The peritoneum is now opened in Douglas' cul-de-sac, and, passing one jaw of a stout hæmostatic forceps into the opening, the bases of the broad and utero-sacral ligaments at their attachment to the uterus are secured and severed, first on one side, and then on the other. This

effectually disposes of the uterine arteries, the most troublesome factors in the operation.

"The bladder is now freed from the uterus, this being a part of the procedure which may be easily accomplished; but in most cases it is one which tries the patience and skill of the operator. As soon as this is done I search for the ovaries and the free ends of the tubes. These are brought down, and, if possible, are clamped with the uterus. If not, they are left and dealt with separately by silk ligatures. If the woman be beyond the menopause, I make but little effort to secure these appendages, proceeding at once to the clamping of the broad ligaments and the removal of the uterus.

"For this purpose I employ scissor-handled clamps with jaws two and a half to three inches long. From this it will be seen that I employ a double set of clamps—one set short in the jaws for the base of the broad ligament; another set long in the jaws for the remainder of the broad ligaments and the structures contained therein. I also employ ligatures, one on each side of the cervix, at the outset of the operation. This I believe to be the best method of securing the vessels, but in case I find that the ligatures employed at the outset have controlled the vessels enough to enable me to separate the bladder without much bleeding, I proceed at once to the separation of that viscus. Opening into the peritoneal cavity first anterior to the uterus, I then open posteriorly, and clamp the entire broad ligament with a single pair of instruments to each side.

"To recapitulate: The ligatures are to control hemorrhage incidental to the enucleation of the cervix, and possibly that incidental to the separation of the bladder. The first set of clamps are for the purpose of controlling hemorrhage which may occur while the bladder is being separated. If none occurs they are to be omitted.

"The second set of clamps are for the purpose of controlling the hemorrhage due to severing all that part of the broad ligament above the first clamps, should they be used, or the ligatures, should the first clamps be found unnecessary. If the two sets of clamps are used, I treat them alike, leaving them in position for forty-eight or seventy-two hours, as I think best.

"As soon as the uterus is cut away and the appendages disposed of, I wash out the cavity remaining with plain warm water, place iodoform gauze loosely in the peritoneal opening and in the vagina, put on a pad, and return the patient to the bed."

The question to be settled is as to the true limits of the operation. No one disputes its propriety in cases of carcinoma and sarcoma limited to the body of the uterus, and most of those who have studied the subject are disposed to concede its indication where the neck is involved. In carcinoma of the vaginal portion the question is, however, still

sub judice. Total extirpation here meets with a formidable rival in the partial ablation advocated by Schroeder, which has a host of vehement defenders. The decision depends not upon the immediate issue *quoad vitam,* but as to which method furnishes the best permanent results. The operation is, however, still too young to make statistics upon this point altogether trustworthy. Martin states that of 44 cases in his own practice which recovered from the immediate operation, 13 relapsed, and 31, or 70.3 per cent., recovered. To be more specific, in his list of recoveries 2 dated from 1880, 3 from 1881, 6 from 1882, 5 from 1883, 6 from 1884, and 7 from 1885. The history of many of his cases still remains, therefore, to be completed.

On the other hand, Hofmeier gives his own results and those of Schroeder in the University Frauen Klinik in Berlin from Oct. 1, 1878, to Oct. 1, 1886. In the eight years there were 136 partial operations, with 10 deaths (mortality 7.4 per cent.). But in the last 50 cases there were but 2 deaths, and in the last 34 no deaths. There were 74 total extirpations, with 12 deaths (mortality 16.2 per cent.). In the last 50 cases there were 3 deaths, and in the last 30 no deaths. With such a record no complaint can be made as to the timidity of the operators or to any lack of primary success. Excluding patients operated upon subsequent to Oct. 1, 1885, there were 114 partial operations, with 10 deaths; 8 cases were unavailable, 1 having died of nephritis, and the fate of 7 having been left undetermined. Of the 96 remaining cases, 47 relapsed within the year. Of 46 total extirpations, 12 died and 1 was lost sight of, owing to emigration to America. Of the remaining 33, 13 relapsed within the year. Thus, of 129 operations available for statistical purposes, 69, or 53 per cent., were known to be healthy at the end of a year. But what was the relative proportions of recoveries in the cases of partial and complete removal? At the end of the first year 51 per cent. of the partial and 63.6 per cent. of the complete cases remained well; at the end of the second year, 46 per cent. of the partial and 24.1 per cent. of the complete were well; at the end of the third year, 42 per cent. of the partial and 26 per cent. of the complete were well; at the end of four years, 41.3 per cent. of the partial were in good health, while not one of the cases of total extirpation was alive.

This curious and unexpected outcome calls for special investigation. It has not been denied, and has not been explained satisfactorily. It remains for the future either to differentiate cases requiring operation or to establish new procedures by means of which the total extirpation will furnish as favorable ulterior results as those that the Schroeder school has won by discriminating methods. Martin, however, draws attention to the fact that with increasing experience the proportion of

total extirpations increases relatively in the practice of those who most warmly maintain the utility of partial ablation.

The method of supravaginal excision, as finally recommended by Schroeder, is as follows: The vaginal portion is seized with volsella and drawn forcibly downward and backward, so that, if possible, the external os is brought to the vulva. A transverse incision is then made, about two-thirds of an inch above the seat of disease, through the vaginal wall to the paracervical tissue. The neck of the womb is stripped from the bladder with the finger to the vicinity of the anterior peritoneal cul-de-sac. The cervix should next be drawn forward, and an incision two-thirds of an inch above the disease should be made transversely through the posterior cul-de-sac. The accidental opening of Douglas' cul-de-sac is to be regarded as a matter of minor consequence. It is even necessary if especially high amputation of the cervix posteriorly is required. The lateral attachments are next separated and bleeding vessels are tied. There is no danger of implicating the ureters, because they recede as the uterus is drawn downward. Amputation is made in the neighborhood of the os internum from before backward. At first the incision should extend to the cervical canal only. Before completing the excision the anterior cervical stump and vaginal wall should be stitched together. The ligatures should be left long, and should be used after completion of the amputation to prevent recession of the stump. After removal of the posterior half of the cervix the cut surface should be covered by the posterior vaginal wall. In closing the wounds upon the sides at least one, and better two, of the sutures should be introduced deep to the borders of the uterus to check hemorrhage from vessels in the parametria.

Prof. W. H. Baker of Boston has modified Schroeder's operation by using Sims' uterotome after freeing the supravaginal cervix and removing a funnel-shaped portion from the uterine body, the apex of which extends nearly to the fundus of the uterus. By this means nearly

FIG. 199.

Baker's Method of High Amputation.

one-half of the body of the uterus is cut away. The actual cautery (Paquelin's) is applied to the whole denuded surface until every bleed-

ing point is checked. The operation is best performed with the patient in the latero-prone position and with the perineum retracted by Sims' speculum. In Baker's report, published in 1886, he stated that of 10 patients operated upon by his method, none died as the result of the operation, and 6 were then living, having enjoyed a respite varying from four to eight years.

Baker regards the cautery as a most valuable means of preventing subsequent extension of the disease through the lymphatics—an opinion borne out by the excellent results obtained by Braun of Vienna, by Byrne of Brooklyn, and others with the use of the galvano-caustic wire and knife. But the necessity of special knowledge in the employment of electro-galvanic agencies has interfered with the popularization of the method.

Some years ago the chloride of zinc was advocated by Dr. Marion Sims as a destructive agent in the carcinomatous affections of the uterus, and quite recently the practice has been revived by Dr. Ely Van de Warker of Syracuse. It is possible that the caustic plan of treatment may merit a place of its own by the side of the brilliant achievements of modern surgery. It consists, according to Van de Warker, in amputation of the cervix at the vaginal junction, extending, however, with knife or scissors, the excavation to the os internum. Hemorrhage is checked by packing the cavity with masses of cotton, the size of a chestnut, soaked in a solution of persulphate of iron in the proportion of one to three of water, and squeezed nearly dry. The dressing should be removed on the second day. He then proceeds to pack the canal and the uterine cavity with masses of absorbent cotton soaked in zinc-chloride solution. Of the latter he employs two strengths—one consisting of ℥v ad ℥j, and a second containing equal parts of chloride and zinc and water. The former he uses when the uterine walls are thinned by disease, so that destruction of tissue beyond a fourth of an inch would involve the peritoneum ; the stronger when the walls are normal. This point he endeavors to determine at the time of the excision of the cervix by introducing a sound into the bladder and the index finger into the uterus to gauge the thickness of the anterior uterine wall, and by a sound in the uterus and a finger in the rectum to judge of that of the posterior wall. To protect the vagina and vulva from excoriations they should be smeared previous to the use of the caustic with pomade containing one part of bicarbonate of soda to three of vaseline. After packing the canal with the zinc cotton he covers

FIG. 200.

Diagram illustrating the effects of the use of chloride of zinc, the dotted line showing extent of destruction.

the surface of the latter and about one inch of the upper portion of the vagina with absorbent cotton saturated in a 30 per cent. solution of bicarbonate of soda. The pain is often severe, requiring hypodermic injections of morphia. The removal of the packing should occur on the second or third day, when it can be done without force ; but where the dressing is firmly cemented it is better to wait a day or two longer. The slough separates in five to ten days. If the strong solution has been employed, the slough is thrown off in a single piece. To avoid hemorrhage the bowels should be kept confined for four or five days, and the urine should be drawn by catheter. In using vaginal injections only a gentle stream should be employed. For hemorrhage after the separation of the slough he advises injections of vinegar. Cicatrization is completed in from two to four weeks, and is followed by marked contraction of the uterine cavity.

I have been the more particular in furnishing these details because they resemble in all essential respects the treatment of Vulliet, which has of late enjoyed considerable vogue in France. The distinctive peculiarity of Vulliet's plan consists in the removal of all accessible portions of the disease with sharp curettes, and in the preliminary dilatation of the cervix and uterine cavity by means of a packing composed of iodoform cotton introduced into the cervical canal by means of slender forceps and pushed to the fundus by uterine sounds. The cotton employed for the purpose is made into balls varying from the size of a bean to that of an English walnut. To each one a double thread is attached. They are prepared by dipping them into solutions of iodoform in ether in strengths of from 1 : 10 to 1 : 30. The milder solution he uses when the size of the uterine cavity permits the introduction of a large tampon, and the stronger one when the cavity is of nearly normal dimensions. As the ether evaporates a coating of iodoform is left upon the surface of the cotton balls. The uterine tampon is left *in situ* for forty-eight hours, at the end of which time the uterus is markedly softened and its cavity is dilated. The tampon should then be withdrawn and replaced by another. In completing the packing the second time pains should be taken to impart to the tampon a conical shape with the apex directed upward. This is effected by drawing upon the threads of the balls first placed, and holding them at the lower segment, while the following ones are insinuated at any desired elevation to secure the requisite shape. This process should be repeated at intervals of two days until the tamponing has been repeated six or eight times—until a complete dilatation of the lower segment has been accomplished and an inspection of the entire uterine cavity is rendered possible.

Vulliet's method of dilatation clears up diagnosis, permits the thorough use of the sharp curette, and enables the operator to safely apply

the actual cautery to the seat of disease. To carry out these objects an anæsthetic is usually necessary. On the following day balls of cotton soaked in a saturated chloride-of-zinc solution should be introduced with the precautions already noted. When sloughing and contraction of the entire cavity follows the use of the caustic, Vulliet advocates the subsequent removal of the ovaries in women who have not reached the change of life. The chloride-of-zinc treatment is likewise possibly available as a palliative measure in cases which have long passed the stage for radical surgery. Unfortunately, it is this class which comprises by far the largest proportion of the unfortunates who apply to the gynæcologist for treatment. The early stages are often devoid of indicative symptoms, and an advanced stage is usually reached before the patient has a suspicion of the existence of a local disorder. The object then to be attained is the mitigation of pain, the control of hemorrhage, the disinfection of the discharges, and the arrest of the cancerous cachexia. That local measures, even in advanced stages of the malady, are available in retarding its progress and in alleviating its symptoms there seems no reason to question.

In the papillary form, or after ulceration has occurred, it is always an advantage to remove as much of the necrosed and bleeding tissue as possible with the sharp curettes of Sims or the sharp spoons of Simon. The ferrum candens or the cautery of Paquelin should then be applied freely to the bleeding surface. The subsequent treatment consists in abundant irrigations with detergent solutions, best made with the vulvar outlet distended by a bivalve speculum. For local dressings each one has his favorite.

Lately Mme. Gaches-Sarraute has furnished a description of the system introduced by M. Siredey in the Lariboisière Hospital. The patients are directed to present themselves at the clinic three times a week. Each one receives at the time of her visit a vaginal douche consisting of three to four quarts of the liqueur de Van Swieten (corrosive sublimate 1 : 1000) or a 4 per cent. solution of chloral. Putrid products are removed by the curette. Disk-like tampons of cotton dipped in one of the above-mentioned antiseptics are introduced into the wound, and are then covered with iodoform. A tampon of cotton is finally placed in the upper part of the vagina to hold the dressing in place. The advantages she claims for this treatment are that the pain ceases, the stench disappears, the wound becomes red and clean, the hemorrhages are checked, the vaginal lesions due to the ichorous discharge heal, the appetite returns, the icteric tint vanishes, and the patient is able to lead a family life.

Bétrin extols the advantages of terebine mixed with equal parts of olive oil or the oil of almonds, as employed by Prof. Vaucher of

Geneva. It is applied by means of small cotton tampons, which can be left in place for two or three days.

Janvrin speaks highly of the milk of Alveloz as diminishing the amount of discharge to a marked degree, and as rendering it decidedly less offensive. My own experience in its use as a local escharotic has been favorable.

I have small faith in the internal administration of drugs as a means of delaying the progress of cancerous disease. Toward the end opium is always needed, and iron, arsenic, and the bitter tonics are often useful in sustaining the patient's strength and appetite. They are of little avail, however, unless vigorously supported by thorough local disinfection.

The last days of a woman suffering from cancer are at best full of sorrow, and the hope of the future lies in the discovery of some sign or indication which will lead to the early detection of the disease, or, better still, in the recognition of the morbid states which serve as forerunners of malignant changes.

SARCOMA UTERI.

The term "sarcoma" was first applied by Virchow to a group of tumors composed in varying proportions of the constituent elements of connective tissue. According to the preponderance of fibrillæ, of cells, or of amorphous matter, sarcomas differ as regards appearance, consistency, rapidity of growth, and symptomatology. In the interior of these tumors the fibrillæ and cells present a fasciculated arrangement. The fasciculi are especially apparent upon fractured surfaces when the tissues have been previously hardened in dilute alcohol or in a solution of chromic acid.

The axis of each fasciculus is formed by a vessel the walls of which are composed of endothelial cells. These vessels are of wide calibre, often exceeding in size the largest capillaries found in normal tissue. External to these endothelial tubes a development takes place of spindle, stellate, and anastomosing cells, the nuclei of which correspond in form to that of the containing cells. In the spindle-shaped variety the nuclei are generally single, while in the stellate forms they are often multiple, the number of the nuclei being proportioned to the size of the cells. The smallest spindle cells measure from about $\frac{1}{5000}$th to $\frac{1}{1600}$th of an inch, the larger ones from $\frac{1}{800}$th to $\frac{1}{250}$th of an inch.

Ackermann[1] regards it as probable that it is from these cells that the fibrillæ are developed. The fibrillæ anastomose and enclose spaces which become evident when filled out with fluid or cell-elements. In

[1] Th. Ackermann: "Die Histogenese und Histologie der Sarkome," *Sammlung klin. Vorträge*, Nos. 233 and 234.

the younger portions of the growth characterized by the production of spindle cells the spaces contain a jelly-like amorphous substance, while in older portions, made up chiefly of fibrillæ, the gelatinous material disappears; and to this fact in sclerotic forms the seeming shrinkage is due.

Sometimes the proliferation of cells is so abundant that the tumor rapidly attains a great size, consisting in such cases of vessels and spindle cells without any corresponding development of fibrillæ. These growths possess a special malignity, due, however, not to the character of the cells, but to the rapidity with which the cells multiply.

In growths which develop slowly fibrillæ have time to form. Usually the spindle cells are there present next to the axial vessel, while the fibrillæ are found in the more peripheral portions. In time these alone may persist, when the tumor ceases to grow, and the vessels may be compressed and become obliterated by the encroachments of the fibrous tissues.

On the outer surface of the fasciculi are found broad, flat cells with rounded extremities, which hang together in the form of sheaths. These Ackermann believes to be the endothelia of lymphatics, and ascribes to them fibro-plastic properties.

Among cell-elements not forming integral constituents of connective tissue there are a number which play an important rôle in certain varieties of sarcomatous development.

In this category may be mentioned the plasma-cells, elongated nucleated bodies distinguishable from other cell-forms in connective tissue by their coarsely-granulated appearance. When present in great abundance in sarcomas they give rise to the large round-cell variety. In these tumors they measure from $\frac{1}{2500}$th to $\frac{1}{700}$th of an inch. They have large nuclei, and present the same granular appearance as in normal tissue. In the rule they are of a rounded shape, but may be polyhedral, flattened, or elongated. Certain of them possess processes due to shrinkage of the cell-body or to pressure, but the plasma-cells do not participate in the formation of fibrillæ. They are found in the neighborhood of vessels or scattered through interstices between the connective-tissue fibres. Thus, single cells or aggregations of cells may be found in meshes formed by fibrillæ. Unlike the alveoli of cancer, however, fibrillæ or fibro-plastic cells may be discovered on careful examination sparsely distributed between the plasma-cells and continuous with the fibres between which the cell-aggregations lie.

In other cases sarcomas are characterized by the presence of small round cells, which resemble leucocytes and the so-called mucous corpuscles. The small round cells may be found in great multitudes in the tissues, forming longitudinal rows between the fibres, or filling out meshes, or occupying the lymph-spaces external to the fasciculi. They

form an important constituent in the milky juice which oozes from the cut surface of the tumors.

Among other microscopic elements sometimes found in sarcomas may be mentioned giant cells containing from twelve to fifty nuclei. They are to be regarded as overgrown spindle cells.

The so-called colloid cancer is now placed in the sarcoma group, under the term "myxo-sarcoma." It owes its gelatinous consistency to the excessive development of the intercellular amorphous substance composed chemically of mucin dissolved in serum. Colloid matter is likewise found in the protoplasm of the cells on the external surface of the fasciculi. These cells, as has already been stated, are in reality endothelia of the lymph-canals.

In the uterus sarcomas may develop in the form of rather circumscribed tumors or of a diffuse infiltration.

The circumscribed sarcomas resemble intra-uterine fibroid growths. Indeed, they long bore the title of "recurrent fibroids." They usually are attached to the uterine walls, very rarely to those of the cervix. The attachment is, in the rule, broad. A true pedicle, as in fibroid polypi, is exceptional. They vary greatly in consistency. They are usually soft, like brain-tissue, or brittle, like wet mortar, or they may be as firm as a soft or even a dense fibro-myoma. They are characterized usually by the abundant presence of round cells, but the spindle cell and myxomatous forms likewise occur. A capsule is rarely present. Hegar,[1] however, describes a case with a well-defined, smooth, firm envelope composed of connective tissue. In certain well-observed instances it has been demonstrated that a fibro-myoma may become converted into a sarcoma. Rabl Ruckard describes a case of circumscribed sarcoma, with carcinomatous degeneration of the uterine walls, and scattered cancerous ingrowths in the sarcoma itself.

In the diffused form the infiltration invades the mucous and submucous layers, and sometimes the uterine walls. Gusserow[2] describes a case which traversed the uterine walls and grew into the abdominal cavity. The inner surface of the uterus presents an ulcerated appearance with fungous excrescences, and is covered with necrotic shreds. The growth is composed for the most part of small round cells, and is of a soft, brain-like consistency. As a rule, in the diffused form epithelial elements are found, so that both Klebs and Gusserow regard most of the tumors belonging to this class as a combination of carcinoma and sarcoma.

In nature the two forms are not strictly separated from one another. Of course in the circumscribed variety the mucosa and submucosa are generally affected, and the diffused variety is ordinarily associated with

[1] "Das Sarkom des Uterus." *Arch. f. Gyn.*, vol. ii. p. 42.
[2] *Arch. f. Gyn.*, vol. i. p. 240.

nodules in the uterine walls. In soft tumors disintegration is in most cases of early occurrence, so that an originally circumscribed tumor may be succeeded by a diffused infiltration.

The uterine walls are sometimes thickened, at others thinned. Occasionally they are of normal thickness. In diffused sarcoma the cervix is often dilated, so as to permit the easy introduction of the finger.

In color sarcomas are whitish, whitish-gray, or reddish-gray. They are usually extremely vascular.

As regards ETIOLOGY, little is known. Rather more than two-thirds of the cases thus far reported developed after the fortieth year. No case of uterine sarcoma is known to have occurred previous to puberty. Of 63 cases gathered by Gusserow, 25 were sterile—a proportion which strongly contrasts with the relative infrequency of cancer in women who have never borne children.

SYMPTOMS.—The early symptoms of circumscribed sarcomas are similar to those produced by uterine fibroids. Thus, the symptoms may be those of pressure, varying according to the size and situation of the tumor; the presence of the intra-uterine growth may give rise to pains of an expulsive character, and sanguinolent discharges may alternate with attacks of menorrhagia and metrorrhagia. Sarcomas are, however, softer and more brittle than fibroids; the capsule is nearly always absent; the growth of the tumor is sometimes extremely rapid; the pains are usually of excessive violence, and the sero-sanguinolent discharges may be present without the tumor's undergoing any destructive changes. In addition to these symptoms rapid emaciation and loss of strength are associated with a marked cachectic condition.

Recurrence of the tumor after removal may take place in four to six weeks, or may be delayed one or two years. The recurrent growth is more rapid in its development than the primary one, and the pains, the discharge, and the hemorrhages are intensified. Life may be prolonged by operative measures,[1] but death finally occurs from anæmia or cachectic conditions, or may result from pyæmia, from peritonitis, or from ileus. Metastases are rare, but still are more common than in the diffuse form. They have been found in the vertebræ, the lymphatic glands, the lungs, pleuræ, liver, and in the pelvic connective tissue.

In the diffused form the uterus is enlarged; its external surface is smooth. Sometimes the proliferated tissue grows down into the cervix, producing the sensation of a circumscribed tumor. That the tumor is the result of growth simply is evidenced by the absence of preliminary expulsive pains. The tissue is soft and easily broken away. Profuse hemorrhages rarely fail. At first occurring as menorrhagia, they gradually lose the menstrual type. The most violent hemor-

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[1] West reports a case which lasted six and a half years.

rhages occur at or subsequent to the climacterie period. In rare cases
the losses of blood are slight, but are then usually continuous. Watery
discharges rarely fail. They possess commonly a disgusting odor even
when disintegration is absent. As destructive changes occur the dis-
charges become of a gangrenous character. The pain in this form is,
in the rule, of extreme violence. It is unlike that resulting from ute-
rine contractions, but is sharp, tearing, and lancinating. Metastases are
less common than in the first form, but the growth has a tendency to
invade neighboring organs. Thus the disease may pass through the
uterus to the peritoneal cavity, to the pelvic cellular tissue, to the blad-
der, rectum, and vagina. The duration of the disease varies from four
months to ten years; the average is about three years. In four cases
inversion of the uterus has been reported.

DIAGNOSIS.—For the foundation of a certain diagnosis the micro-
scope is indispensable. Sarcoma may exist, and yet typical symptoms
may be absent. As a rule, however, the symptoms alone suffice to ren-
der the diagnosis probable. A seeming fibroma first appearing at the
climacteric, or a small fibroma which grows rapidly at the change of
life, is almost certainly a sarcomatous product. Hemorrhage contin-
uing after the climacterie is characteristic of sarcoma. Sero-sanguin-
olent discharges are not observed in fibromata unless associated with
destructive changes. In sarcomas they occur at an early period, owing
to the vascularity of the tumor and the absence of a capsule. Again,
the pains are more agonizing and the tissues are softer and more brit-
tle. The occurrence of rapid emaciation, with loss of strength, anæmia,
and general cachexia, completes the diagnosis.

In diffuse sarcoma or carcino-sarcoma of the fundus the only condi-
tions likely to be confounded with it are fungous endometritis and the
benign forms of adenoma, but in both of these conditions cachexia is
absent. In adenoma there is, however, often a sero-sanguinolent dis-
charge. A dilated cervix and a tenderness of the body of the uterus
point to sarcoma.

A year and a half ago a patient fifty-three years of age consulted me
for profuse uterine hemorrhages. She was extremely anæmic, but not
cachectic. The uterus measured four inches in length. With the
curette I removed a soft growth from the fundus about the size of an
English walnut. I felt sure that it was a sarcoma. Dr. Biggs, how-
ever, made a microscopic examination, and found the growth made up
of proliferated gland-tubules, and pronounced it of a benign nature.
The patient has since enjoyed perfect health.

A microscopic examination of mere scrapings does not always yield
a satisfactory result. To determine the nature of the growth it is
essential that fragments should be obtained of sufficient size to enable
the observer not alone to make out the presence or absence of spindle

or round cells, but the relations of the cell-forms to the other tissue constituents.

The TREATMENT of sarcoma is the same as that of a cancer. Owing to the fact, however, that it is frequently practicable to make the diagnosis at an early period prior to the occurrence of metastases or the invasion of other organs, the opportunities for complete extirpation more frequently occur than in pure carcinoma. In the resort to palliative measures pains should be taken to avoid wounding healthy tissues, as new formations have resulted from inoculations made by tenacula employed to steady the uterus during manipulations.

LACERATIONS OF THE CERVIX UTERI.

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INTRODUCTION.—There are two kinds of laceration of the cervix uteri, the one being at right angles to the canal, commonly called rupture, the other being parallel to it.

Of the former we find numerous examples in the older textbooks; in fact, it is the laceration of the cervix which up to recent years has been the most made of; the other, which it is our purpose to consider, had been recognized from time to time, notably by Sir James Y. Simpson and Dr. I. H. Bennet, but its importance had not been appreciated by accoucheurs nor by physicians at large.

It is now universally conceded that to Dr. Thomas Addis Emmet belongs the credit of having first recognized this injury in its multiple forms and of having devised the operation for its cure.

Dr. Emmet himself tells us, in his *Principles and Practice of Gynæcology*, how he was first led in 1862 to an understanding of this condition, and to the appropriate procedures for its treatment.

Since his first paper on the subject in 1869, this lesion, its consequences, and its treatment have engaged the attention of the gynecologists of this country quite as much as, if not more than, any other one subject; and of late years its importance has been fully recognized in other countries as well, though it is remarkable, as shown by the small amount of literature contributed, how indifferently the repeated mention of its bearing on disease has been received by foreigners. Even since the matter has been taken up as a recognized entity of pathology we find but little put forth in other lands to the elucidation of any point connected with it which had not already been pretty thoroughly exposed and discussed in this country, and largely by the discoverer himself.

It is in Germany that the labors in this direction have been the most appreciated, and much work has been undertaken to verify the statements emanating from this country or to disprove the claims of those who recognize for this condition a much wider field of importance than has usually been accorded it.

In England the subject was taken up with great circumspection, and has only recently gained a permanent foothold. In 1880, at the meeting of the British Medical Association, held on Aug. 12th, Dr. Montrose Pallen of New York read a paper on "The Etiology and Treatment of Laceration of the Cervix uteri," and W. S. Playfair, M. D., presiding, is reported in the *British Medical Journal* for Sept. 4, 1880, p. 371, as expressing a fear that "on this side of the Atlantic [England] there are few who are competent to discuss the matter from personal knowledge." I believe, however, that Dr. Playfair himself, and also Dr. Robert Barnes, had at that time already operated for the repair of this injury. This is shown in a correspondence of personal character carried on in the same journal of 1886.

Something of an answer to this paper of Dr. Pallen's was prepared and read by Dr. I. Henry Bennet at the International Medical Congress, seventh session, held in London in 1881, which is reported in the *Transactions*, p. 337 : " He thought the operation a totally unnecessary one, unless in some extreme exceptional case."

Dr. Playfair said on that occasion : " It has up to this time received, I may safely say, no serious study at all at the hands of British gynecologists." Dr. Playfair was, however, a marked exception, for at that time he was making a very serious study of the subject and appreciating its importance.

In France the profession has just begun to learn of the lesion and its treatment. In 1880 we find a report of one operation performed by Prof. Tarnier for the repair of the cervix, and in 1883 and 1884 two by M. le Dr. Marchand, also of Paris.[1] Fage[2] mentions two others by Dr. Peyrot. But still, in 1878, P. Budin[3] wrote : " Every one is so familiar with these fissures that we need not do more than mention them." In 1880, M. le Professeur Trélat wrote : "It is not my intention to study with you all the diseases of women, but only those in which operative interference is called for ; for instance, malformations of the internal and external genitals, tumors of the uterus and annexes, ruptures of the perineum, vaginal fistulæ, etc.," and makes no mention whatever of this condition. On p. 247 of the same book he speaks of uterine disease resulting from mechanical cause, and mentions " prolapsus," but says nothing of any other. His second group he makes depend on faulty nutrition—viz. metritis, acute and chronic. He says : " In chronic metritis there are very appreciable changes in the structure of the uterus—changes which may bring about displace-

[1] L. Jacquelot in " Contribution à l'Étude des Déchirures du Col de l'Utérus," *Thèse de Paris*, 1884.

[2] Étude sur l'Opération d'Emmet," *Thèse de Paris*, 1881.

[3] *Des Lésions traumatiques chez la Femme dans les Accouchements artificiels*, Paris, 1878.

[4] *Annales de Gynécologie*, vol. xiii. p. 83.

ments. One step more, and these changes in structure, bearing as they may on one point of the organ, will deform it; for instance, hypertrophy of the neck, described by Huguier, total hypertrophy or *situated on one lip only:*[1] these hypertrophies may become considerable." He removed such an hypertrophy, "a sort of appendage springing from the anterior lip of the uterus."

A Paris thesis of 1878 by Dr. Leroty, on *Hypertrophy of the Vaginal Portion of the Neck*, although considering the questions of parturition and traumatism as causes of this hypertrophy, makes no mention whatever of laceration. Even Courty is quoted: "Sometimes, on the contrary, the hypertrophy, being most marked on the internal layers" (of the organ), "produces a rolling out of the two lips, a sort of inversion of the orifice of the neck, which spreads, opening out like a flower, showing the mucous membrane of the canal spread out on the convexity of the cervix itself."

Leroty further says: "When the anterior lip alone is hypertrophied, the orifice is thrown backward at the base of the tumor and is shaped like a crescent. If the cervix is bifid, the os is found between the two floating tongues." Again: "Hypertrophy of the cervix seems to have a most pernicious effect on pregnancy. In reading the published observations of this disease one is struck by the large number of abortions which it seems to have produced." Could anything be more descriptive of an unrecognized laceration of the cervix with ectropium?

Then, in 1879, comes the thesis of Desvernine (Paris), *Contributions to the Study of Lesions (lacerations) of the Cervix uteri*, where the whole subject is fully set out and elaborated on material obtained in New York under the clinical instruction of Sims, Emmet, and Thomas; yet in 1880 appears still another thesis on *The Hypertrophic Elongation of the Infravaginal Portion of the Neck of the Uterus*, by Dr. Curvale; and here, again, not an allusion is made to the injury.

In a general way, then, we gather from opinions enunciated during the past few years that the greatest significance is attached to this lesion in our own country, and that the operation finds among our people its strongest advocates. Next to us stand the Germans; next in order, the English; finally, the French, who are just beginning to realize the pathological bearing of the injury.

However the question may at present stand, certain it is that the greater the variety of opinion expressed the sooner will the whole subject of this injury and the operations for its repair find their just level of importance; and the more thoroughly the question is studied, the sooner will the exact sphere of these operations be defined through an understanding and consequent mastery of their difficulties.

[1] *Italics* are mine.—B. E.

The references in this article are not simply to authorities, but in many instances furnish indexes to subjects of collateral interest.

ETIOLOGY.—We cannot fully appreciate the causes of this lesion unless we divide them into the *predisposing* and the *determining*. The predisposing are those which weaken the part which gives way; the determining are those which make the part yield.

Though this is a lesion commonly associated with parturition, yet it is not confined to that state alone; consequently, we shall have to consider some few outside conditions in which it may occur, before proceeding to the study of that with which we are most wont to associate it.

We might still make one more distinction, and class the various lacerations as either surgical or obstetrical. The predisposing causes of laceration of the cervix are all those which in any way interfere with the nutrition of the part, so that it becomes less elastic than is normal, and incapable of bearing any strain which is put upon it. Such is a varicose condition of the pelvic veins, which condition is also manifest in the cervix; such are long-continued intracervical inflammations, erosions, granular and cystic degeneration of the cervix, malignant disease, and the more remote causes of strumous habit, leucocythæmia and tuberculosis; such, again, are growths within the uterine body, which in forcing their way out distend the cervix and thin its walls.

In the pregnant woman additional predisposing causes are placenta prævia, twin uterine pregnancy, monstrosities, hydramnios, pendulous belly, and deformed pelvis; lack of proper care in confinement to hasten labor or to retard it; delayed labor from any cause; rigid, non-dilatable os, and excessive uterine contractions producing precipitate labor. Previous labors, inasmuch as they may have left a fatty cervix or slight fissure, or even partial lacerations of the cervix, are predisposing causes. The same is true of breech presentations, which occur most commonly in women who have borne a number of children.

Determining causes, in general, are those which either directly produce the lesion or which are actively contributive. Such are, in the non-parturient, the sudden escape of a uterine tumor, rapid divulsion of the cervix, extraction of polypi or fibroids, and, so far as the lesion is concerned, though the appellation will differ, I may also mention posterior and bilateral section of the cervix.[1]

In the pregnant woman, abortions, accidental or wilful; excessive size of any part of the child; breech or shoulder presentation, or union of the bones of the head so that it cannot adapt itself to the outlet;

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[1] See *Obstet. Gaz.*, Cincinnati, 1884, vii. p. 57: "Posterior Section of the Uterine Cervix in a Virgin for Dysmenorrhœa, followed by Serious Nervous Symptoms; relieved by Trachelorrhaphy," by T. A. Reamy, M. D.

hurried forced labor before dilatation of the os is completed; misman-agement of the forceps at any time; version in its first or third stage; labor interfered with or complicated by anything which diminishes the space in the pelvis; and all forms of violence to the cervix, notably the various obstetrical operations, and the needless meddling with the os which is frequently practised during labor to assist in its dilatation,—may be classed as determining causes.

To review some of these causes briefly: first, the predisposing. A varicose or enlarged condition of the veins of the pelvis is often to be noted in women of full habit, yet who are perhaps poorly nourished. We see it, at times, marked about the vulva, beneath the arch of the pubes, along the base of the bladder, and, following it up, we find a similar condition of the cervix.

From whatever cause this state proceeds, a change similar to that occurring in pregnancy may take place when the uterus is not preg-nant, and so change the nutrition of the parts that it would require but a slight violence in the way of dilating the cervix to produce a lacera-tion of the parts. I have seen two marked cases of this condition—one in a woman who had borne a child, but was not pregnant; the other in a young girl of seventeen who had just become pregnant through seduction: when I saw her she had missed but one period, consequently was not sufficiently far advanced to have the vessels assume the fatty change accompanying pregnancy, yet those about the vulva, especially under the urethra, were as large as goosequills, were soft, and filled up the entrance to the vagina. A similar condition prevailed within the vagina and about the cervix, so that it gave the parts an exaggerated appearance of advanced pregnancy. I did not have the opportunity to learn how she bore her parturition.

There is a time when the cervical inflammation, having distended the canal and spread down to the external os, causing erosion and degeneration, cystic and granular, so softens the part and thins out the substance of the cervix that it will readily tear through should it be put on the stretch; as, for instance, in drawing down a fibroid.

In cases of malignant disease the actual cell-structure is changed; the parts, being much modified by over-abundant blood-supply even before breaking down of the new structure occurs, are most ready to yield to any dilating force. Nor is there danger only after the occurrence of softening of the tissues. Even during the early stages of infiltration and deposit the parts, being much more rigid and undilatable than normal, are liable to rupture.

The same is true of the chronic inflammatory affections, in the early stages of which the tissues, though not yet softened, are yet quite as likely to yield to an undue dilating force on account of the loss of

normal elasticity. Therefore the chances are that an early tear will be much more extensive than one occurring in a softened cervix.[1]

Constitutional impairment, through its interference with local nutrition, may produce a weakness in the uterine tissues which may escape our attention unless the uterine discharges so commonly present with systemic diseases plainly indicate the necessity for treatment.

To pass to the condition of pregnancy, for it is here that the most important lacerations occur. We can readily understand the predisposing influence toward laceration exercised by the implantation of the placenta directly at the site of the cervix (placenta prævia). Nutrition is markedly stimulated, structural changes going on in its tissue to such a degree that the parts are more softened than they otherwise would be were the placenta engrafted elsewhere.

Apart from such an effect, we have to face the probability, at the time of delivery, of its leading to version, thus bringing into play one of the principal determining causes.

Abnormal pregnancies, as when twins, monstrosities, and hydramnios occur, act as predisposing causes, since they over-distend the uterine cavity, thus weakening its walls and entailing retarded labor ; or else, through malpresentation or obstruction, uterine contractions are powerless and some obstetrical operation has to be performed.

Delayed labor may be produced in many ways, and it acts variously, both as a predisposing and determining cause ; for instance, fibroids in the body of the uterus which prevent uniform, equable, properly-directed contractions, retard labor and become predisposing causes ; a fibroid at the outlet, obstructing labor and causing one portion of the cervix to be much compressed and contused by being carried down ahead of the mass, becomes at once a determining cause.

Labor may be delayed by the rigidity of a non-dilatable os, which forms a predisposing cause of laceration by its tendency to induce thinning and weakness of the walls. Excessive uterine contraction then becomes the final cause of rupture. Again, when labor has simply been delayed by ordinary causes, even though the os may be dilatable, though undilated, the sudden bursting forth of the uterine contents may produce a laceration, just as if a fibroid escaped very suddenly from the cavity before the os was quite ready.

It is very essential that a proper distinction be made between the two forms of rigid os which have been described as "spasmodic" and

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[1] "Observations on Laceration of the Cervix uteri ; its Ætiology, Pathology, Prevention, and Treatment," by Dr. W. G. Wylie, in *Amer. Journ. Obstet.*, New York, 1882, xv. 76–102. See also discussion of paper by Drs. Garrigues and Putnam-Jacobi ; the latter's remarks on œdema and its effect on unstriped muscular fibre as contributing to laceration ; this event also explained by too violent contraction of upper segment of uterus before lower segment has ceased contracting, in *Med. Rec.*, New York, 1881, xx. 498.

"mechanical." In the *London Lancet* of 1860 (ii. p. 484) we find some remarks on extreme rigidity of the os uteri, in which the author, Charles D. Arnott of Edinburgh, recommends gradual dilatation by the finger, at the same time forward traction on the cervix, and, in extreme cases which resist this, division by a guarded bistoury in order to prevent spontaneous laceration of the resisting uterine tissues.

On p. 547, Dr. Fisher of Terrington holds that Dr. Arnott has mistaken his cases, and that those he describes as being "rigidity of os," when the head presses down on a segment of uterus anteriorly while the cervix is high up and closed, are really such as authors have described as of pendulous belly or anteverted uterus, and that he would be in great fault to incise in these cases, as they can be perfectly treated by position and hooking the cervix forward during the pains. In real cases of rigid os, when the cervix is tense and unyielding, thin and dry, with edges like paper, or tense and unyielding, but very thick, with rounded edges, he recommends a depressant.

He refers also to Rigby's *System of Midwifery,* p. 196, where Dr. Dewees is quoted. These both refer in strong language to the conduct of those who incise the cervix in such cases where the difficulty is simply due to the anteversion—that is, to a misdirection of the forces.

Last, but by no means least in the category, I place the early rupture of the bag of waters[1] and the escape of the amniotic fluid. This protruding segment of a sac boring the way for the passage of the fœtus and acting as a constantly present wedge, receding and advancing with the uterine contractions, is recognized as the best possible dilator of the cervix. Remove this while the os is still undilated, and we have labor arrested for a time; the dilatation of the os cannot proceed until the presenting part of the child comes down. Fortunate is the case, as to progress, if it be the head instead of a shoulder or the breech; but, at the best, this solid body making the dilatation is hard and blunt, sure to compress and contuse the soft parts against the sides of the pelvis, which fits them for almost positive rupture when the delivery takes place.

Shoulder or breech presentations delay labor and render the uterine contractions powerless, besides ultimately calling for the introduction of the hand. This, in itself, is not in any way objectionable as regards a possible laceration if dilatation is accomplished or is even possible; otherwise, such a volume thrust through a rigid os, shape the hand in cone as we will, must of necessity endanger the integrity of the parts. So it is in the third stage of version, the removal of the hand grasping the fœtal part.

In the same manner we understand how the application of the forceps, if the os be not dilated, must produce a like injury, which is especially true of the long forceps, since their use implies, of course,

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[1] "Étude sur l'Opération d'Emmet," *Thèse de Paris,* 1881, du Docteur Fage (Marc).

that even the head has not come down and cannot have assisted in dilating the cervix ; consequently, it cannot be very dilatable. The forceps also may do very great harm if the accoucheur after the application of the blades uses undue force and displays but little caution in making traction. The parts may yield suddenly, and he may then feel certain of having produced an extensive laceration of the cervix.

The untimely use of ergot must also be condemned, for the reason that it produces excessive uterine contractions, and thus may make the os yield before it is fully dilated.[1] It is now held by many that this drug is out of place until the uterus is empty of fœtus and secundines.

Now, for one moment, to refer to a possible cause of harm of this kind, though out of the parturient state.

It has always seemed to me inexplicable that the extensive divulsion practised by so many gynecologists now-a-days for a great variety of ills should not occasionally result in lasting injury to the cervix. A firm, unyielding tissue made to give way suddenly must rupture in some of its parts. I have seen blood from using even the graduated stem-dilators of moderate size : I have handled the divulsors in common use, even within the cervix, though I have never practised full dilatation in this manner, but I have seen many cases in which it had been thoroughly done by others, and I must say the appearance of the canal was anything but natural. I have occasionally seen a cervix which seemed to have been actually ruptured, but whether the cervical catarrh with eversion and beginning cystic disease was the result of that operation, or whether it was due to the then present pelvic inflammation, it was not possible for me to tell. Candidly, I have suspected the pelvic inflammation to be attributable to the surgical interference. Another case, however, rather more convincing, has been related to me by Dr. T. A. Emmet as having passed through his hands on the way to the grave : it is the same one mentioned in his article read in the section of Obstetric Medicine at the annual meeting of the British Medical Association in Brighton, 1886, entitled "On Certain Mooted Points in Gynecology," and published in the *British Medical Journal*, 1886, p. 910. He there speaks of a young lady brought to him during the previous spring whose cervix had been dilated two years before, and "purposely lacerated" with the object of keeping the canal open because of dysmenorrhœa (the operator, one of America's most noted gynecologists). Dr. Emmet discovered an old peritonitis, and the patient told him she was very ill after the operation from an attack of inflammation, and never regained her health. In the cleft of a triple laceration Dr. Emmet discovered an epithelioma, which developed so rapidly in a few days that he feared any operation might prove of little

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[1] "Can Lacerations of the Cervix uteri be Prevented?" W. M. Polk, M. D., in *Trans. Am. Gynec. Soc.*, Philada., 1881, vi. 407–412.

benefit. Since that writing the young lady died from spread of the disease.

PATHOLOGICAL ANATOMY.—The gross appearances of a lacerated cervix will be fully set out when we come to consider the question of diagnosis. We shall here, however, study somewhat more minutely what is going on in the tissues apart from that which is discernible by the touch and the naked eye.

As soon as the laceration has occurred, there is, of course, an open wound, which heals more or less rapidly according to the greater or less amount of cleanliness maintained.

Should the opposing surfaces be in coaptation, the parts being kept reasonably clean, union by first intention takes place, and, should this occur along the whole line, it may be that no trace of laceration will be found, not even a thread-line to indicate the site of the lesion.

Such perfect union is, however, rare. We generally find fissures about the crown of the cervix running up into the canal, with indurated tissue between the nodules; or a more positive solution of continuity on one side or both of the cervix, with a decided mass of new formation filling up the gap at the angle of repair; or, perhaps, a complete destruction of one portion or another of the cervix from sloughing, with rolling out of the cervical mucous membrane, the exposed portion being covered over by an erosion or abrasion, and frequently by enlarged and diseased follicles.

In short, we may consider four different points which bear on this condition: cicatricial tissue, eversion or ectropion, erosion, and cystic degeneration.

The cicatricial tissue, when found in an angle as a result of union by granulation or secondary union, will be more or less thick according to the separation between the opposing surfaces, tapering from the most gaping portion up into the extreme angle of the wound, and more or less dense according to the time which has elapsed since the occurrence of the injury.

This tissue is held to be cicatricial from analogy largely, also from its behavior in producing contraction and distortion of the neighboring parts, and from its character as felt under the knife.

Microscopic studies do not show us anything more positive than a condensation or packing together of fibres which may be new in their formation, or a conversion of the normal tissue of the cervix at that point.

In some cases we find, on inspection by the microscope, that these packed bundles of fibrous tissue are not confined to the angle of repair alone, but have also formed in the immediate neighborhood, in small patches or in more extensive masses, a hyperplasia of connective tissue.

Then, again, we see that the tissue in the angle where this new for-

mation lies is devoid of epithelium, except as it is crowded upon from the mucous membrane of either side, such bared surface depending on the thickness of the cicatricial wedge.

The supply of blood-vessels in these parts is diminished, and in many cases entirely wanting, which fact coincides thoroughly with clinical experience; for no operator can have failed to notice how little hemorrhage follows even a deep cut into such tissue. It is only after passing beyond its boundary laterally, or going deeper into the tissues above it, that we are at all troubled with hemorrhage.

The question of nerve-supply is one which cannot be immediately settled, but from observation of the symptomatology we are led to infer that either these parts must be abundantly furnished with nerves, or that the few present must assume a marked exaltation of function.

When we recall how insensitive is the normal cervix, and then contrast this with our every-day observation of the painful character of certain points upon the cervix or of pain transmitted by touching otherwise insensitive parts, we are led to ask, Has there been here a development of nerve-filaments? or have those insensitive ones—namely, those filaments of the sympathetic system accompanying blood-vessels —become transmitters of sensation to the cerebro-spinal system?

We frequently find the cervix painfully sensitive to the touch, which may indicate that we have jarred a sensitive cellulitis or peritonitis. On the other hand, it may be a truly cervical pain or one in some remote part of the body. If local, it is possibly because of cicatricial tissue or other equally hard body imbedded in the softer substance of the cervix, touching and pressing upon filaments of the sympathetic system which communicate with sensitive fibres of the cerebro-spinal system. We must explain in the same manner the distant pain or neuralgia awakened by pressure on these parts without there being any manifestation at the spot touched.

It may seem inconsistent to call to our aid, for an explanation of this circumstance, the filaments accompanying blood-vessels, since we have stated above that the blood-supply in many cases was *nil;* but it will always be recognized that capillaries abound in the immediate neighborhood of such cicatrices, the same as we see about any foreign body; and the more numerous they are, the more active must be the nerve-supply.

Now, whether the cicatrices roll the parts out, whether the weight of the uterus accomplish this by making the anterior lip descend in the axis of the vagina, the posterior being held on the floor of the pelvis, or whether this be produced by the acquired fulness of the lips due to cystic disease and proliferation of connective tissue, need not concern us at this point. Undoubtedly, all these various agencies are at work in the same or in different cases, and as a result we have the mucous

membrane of the uterine canal more and more everted, and presenting in the place of the crown of the cervix, forming an ectropion.[1] Of course, this is the more marked the greater has been the slit or the more numerous have been the fissures in the cervical tissue.

This exposed mucous membrane becomes to some extent infiltrated along with the cervical tissue itself, raising up the epithelial covering and impairing its nutrition.[2] There is a certain amount of engorgement which is due to full vessels outside and to the accompanying prolapsus uteri.

This infiltrated tissue and weakened epithelium, exposed to friction, and bathed also in the discharge which is present in these cases as a sort of exosmosis brought to the relief of the congestion, commonly assumes a change called erosion. This may be limited to the mucous membrane in the canal or to that which is rolled out, but in some cases, notably those which are accompanied by an acrid discharge, a similar condition may show itself even on the otherwise sound mucous membrane of the cervix up to the vaginal attachment.

The erosion is formed by the destruction, in part at least, of the epithelial covering and increase of the underlying papillæ. In some places outside of the canal pavement epithelium may be found to the depth of several layers still protecting the surface; in others, and more positively so when the parts have been exposed to much irritation, cylindrical epithelium is alone found, but this may also be wanting.[3] Beneath this surface we find enlarged loops of capillaries, enlarged glands, and hypertrophied villi—the glands and capillaries alone in the mucous membrane of the cavity of the neck, the hypertrophied villi and capillaries on the surface of the cervix. These villi, increasing to a still greater extent, form fungosities and granulations, in many cases growing to such a size that they become pendulous.

With all this there is an hypertrophy of the submucous layer due to a proliferation of connective tissue; and it is still an unsettled question whether the normal structure of the cervix is not at times entirely converted into connective tissue.

Cystic degeneration, which has been called also glandular erosion, may next engage our attention.

The glands of the endocervical mucous membrane becoming inflamed

[1] "Considérations sur l'Éctropion du Col de l'Utérus et l'Opération d'Emmet," Terrillon et Lermoyez in *Bulletin gén. de Thérap., etc.*, Paris, ci. 106–121.

[2] "Die Erosion und das Ektropium," Fischel, *Centralblatt für Gynäk.*, 1880, p. 425; and "Ueber den Bau und die Pathologische Bedeutung der Erosionen der Portio-vaginalis uteri," Fischel, *Zeitschr. für Heilk.*, Prag, 1881, 261–300.

[3] "Histological Characteristics of Ant. Lip of Cervix, from a Case of Deep Laceration and Early Epithelioma of Post. Lip," Galabin, in *Obstet. Journ. of Great Britain*, 1879–80, p. 638; same. in vol. xxiv. of same journal, p. 53: "Histological Results of Lacerated Cervix, Two Specimens."

and their outlets closed, they distend, and finally burst. Many have a thick wall, and cannot readily empty themselves, so that they continue to enlarge, and frequently attain the size of a pea. The ordinary size is that of a small head of a pin, and of such thousands may be counted. In case the outlet is closed and any ramification of the gland enlarges in an isolated manner, it also forms a cyst. These cysts are found nominally only on a surface which has formed part of the lining mucous membrane of the cervix ; practically, however, they occur on the vaginal portion of the cervix, but it may be that their development has been toward the periphery of the cervix rather than toward the canal aspect, which would account for their presence on such a mucous surface ; for I think it is well established that there is no glandular structure in the vaginal mucous membrane covering the cervix. The other explanation is found in accepting Ruge's[1] and Veit's view, that new glandular structure is formed by repeated infolding of the normal mucous layer, each new depression being thus naturally lined by cylindrical epithelium, and successive acini being formed from each parent offshoot. These become, in time, choked and over-distended, giving us the numberless cysts visible on the everted mucous membrane, as well as on that which has hitherto not been furnished with glands.

When first these pouches inflame, their contents change gradually from the normal thin, alkaline mucus which lubricates the cervical canal to an acid discharge, ultimately becoming purulent, which carries away with it broken-down epithelium of its own destruction. The contents of the new formation may not be irritating, as were those of the parent gland ; the secretion at first has, in fact, more the character of health ; being locked up, however, it becomes inspissated, and so, as a rule, we find it thick and gummy. At other times it becomes caseous and even calcareous ; then, again, we see it break down, assuming a partially purulent character.

These cysts crowd each other in such profusion that they give a special hardness to the rolled-out mucous membrane, and assist very materially in producing and maintaining the ectropion. Being in such abundance, oftentimes they very naturally diminish the vitality of the parts, not alone by their pressure, which crowds out the proper vascular supply, nor yet alone by their subsequent rupture and cicatrization, which leaves a hardened surface, but also because their presence provokes a constant new formation of cellular tissue, with subsequent atrophy.

SYMPTOMATOLOGY.—We may consider the symptomatology of lace-

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[1] " Die Erosion und das Ectropium, sowie über die Herkunft des Cylinderepithels an der Vaginalportio bei Erosion," C. Ruge, *Zeitschr. für Geburtsh. und Gynäk.*, Stuttgart, 1880, v. 248–255.

rated cervix at the time of its occurrence, and later when the attention of the patient is drawn to it by a new train of events.

First of all, from the attendant circumstances of the labor the mind of the accoucheur may already be awakened to the possibility, if not the probability, of such an accident having taken place. He has seen the violent efforts of the uterus, the resisting os, the large size of the presenting part, possibly even a faulty presentation; he has felt the lips of the cervix hot, dry, and tumid; he has been well aware that the anterior lip is carried down and is crowded behind the pubes; and when, with these conditions, there comes a rapid delivery after it has been delayed, he need not be astonished to see it followed by a profuse hemorrhage.[1]

This will, of course, not of necessity indicate that there has been a laceration of the cervix: there is still the placenta to come away and the uterus to contract. In fact, even with an extensive lesion the hemorrhage may not be great. The parts have been much compressed and the vessels are not necessarily gaping; they have also been lacerated, and, as often happens in such cases, they do not bleed freely. But should an abundant hemorrhage take place and persist as soon as the delivery of child and placenta is completed and the uterus is contracted, the physician is warranted in assuming that a solution of continuity has taken place in some portion of the genital tract; and clinical experience indicates that injuries to the cervix are the most common lesions of childbed.[2]

From this time until the case has become really a chronic one there may be no symptoms whatever to indicate that any serious lesion has taken place. I say, advisedly, "there may be no symptoms," for, depending upon the extent of the injury, we shall possibly see a sequence of events dating from the delivery, readily recognized by the expert, which, rationally interpreted, will lead us to diagnosticate the lesion under consideration. Such will be a slight or, it may be, a marked degree of feverishness, the somewhat tardy arrival of the milk in the breasts, the same being scanty in amount, and probably an early cessation of lactation, so that the mother is obliged to give up making the attempt to nurse her child. Possibly, she and her physician have by this time become aware that there is some pelvic trouble, but it is rather infrequently that the relation of cause and effect is appreciated by the parties interested.

Later on, it is noticed that the mother, although freed from the tax

[1] See *Amer. Journ. Obstet.*, New York, 1882, xv., Suppl., 48–53, Dr. C. H. Thomas: "Laceration of the Cervix uteri producing Post-partum Hemorrhage."

[2] See *Med. and Surg. Reporter*, Philada., 1882, xlvii. p. 729: "Laceration of the Cervix uteri as a Cause of Post-partum Hemorrhage and of Secondary Hemorrhage during the Month," by S. W. Dickinson, M. D.

of nursing, does not pick up : she is pale and haggard ; she begins to complain of a dragging about the hips and loins ; and the chances are that she will also complain of a persistent sanguineous discharge or of a leucorrhœa. She is without appetite, her digestion is indifferent, her sleep is disturbed, and the bowels are costive.

It may appear to the reader that I am overstating the case in making these symptoms characteristic signs of laceration of the cervix uteri : to one more familiar with uterine diseases, however, I feel convinced that here will appear, on the contrary, only a true portraiture of an average case of lesion of this character. The truth is, that these symptoms have been and are so universally ascribed to "weakness," their true significance not being sought, that the case is seldom thoroughly made out. These symptoms may persist or may gradually diminish, yet the patient will probably settle down into a condition of ill-health. The symptoms are not always, however, such as are here described.

Although this condition occurs in all walks of life, the most marked symptoms following the slightest lesions are found in the upper ranks, provided the patients have not received such treatment as their condition demands and their means enable them to command. In working-women, on the other hand, great injuries are found existent without the patient's knowledge. These women have not the time or the opportunity to watch themselves closely and to heed every small pain, a dragging here, a weight there, or even to question closely why their health is not what it used to be.

The attendant subinvolution and consequent increase of size and weight of the uterus, possibly also the accompanying over-distension of the vaginal walls and destruction of the perineum, contribute in some measure to the production of these ailments ; still, the association of these additional features with laceration is so frequent, if not general, that we are even justified in looking upon the injury to the cervix as, in the main, the cause of the whole, or in other instances as the first product of a common cause.

The disease is now becoming well established, though not by any means chronic, since the injury for a considerable time still remains in *statu quo*, and the subjective symptoms are not by any means as marked as they will become later on. A few months more, however, will transfer it to the chronic infirmities.

We notice, in the first place, that the woman fails to regain the health she has lost : it is not a mere temporary failure of restoration— she has become a permanent invalid ; all her color has gone, and the persistent use of tonics fails to bring it back. The dragging about the hips and loins is there still, so also is the uterine discharge. There is dyspareunia, coitus is commonly followed by a show of blood, besides

which there is very frequently a total loss of sexual desire.[1] In addition to these symptoms we have disturbances of menstruation. In some individuals the flow is markedly less, even to the point of cessation. This occurs in women who have by no means reached the normal climacteric, but in whom either the complicating peritonitis has invaded the ovaries and rendered them useless, or has occluded the Fallopian tubes, or in others with whom there is a condition of superinvolution rather than subinvolution, the menopause being virtually established at an early age.

With most women, however, the menstrual disorder is the other way, there being menorrhagia and metrorrhagia, both due to complicating inflammations promoting uterine and tubal congestion; then, again, the habitual accompanying fungous condition of the uterine mucous membrane is a constant source of similar trouble.[2]

There is another symptom which has more significance; that is, the oft-repeated miscarriage, without, so far as the patient knows, any appreciable cause. This occurrence is readily understood from the condition of parts as seen in the section on Complications. In other women sterility will be persistent, dependent on the presence of a thick cervical discharge.

The most marked and characteristic set of symptoms, however, lies in the nervous system. That previously mentioned—namely, the change in the character of the blood—is one of the more prominent. The more or less constant pain in the back of the neck and at the base of the brain belongs to the same class of symptoms. The failure of memory either as to names or facts, and a feeling of dragging at the back of the eyes, are also common, and the variable or irritable disposition is one of many symptoms which we are almost sure to find present in a chronic case.

Many other effects on the nervous system, elsewhere enumerated as complications, are not mentioned again here, inasmuch as they are in no wise specially pathognomonic.

COMPLICATIONS.—Though it might be supposed, if all proper means of cleanliness be taken during and after labor, that no inflammatory complications can arise, yet we meet with them even in spite of the best efforts at prophylaxis. Many physicians do not understand the wisdom of the *aseptic* treatment, and they will not employ any such means until the *antiseptic* is imperatively called for, and then it may be too late.

One of the early possible occurrences after a laceration of the cervix

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[1] "An Analysis of Forty-four Cases of Laceration of the Cervix uteri," by Dr. E. I. Ill. in *Trans. Med. Soc. New Jersey*, 1882, 157–161.

[2] "On Lacerations of the Cervix uteri, their Consequences and Treatment," by T. M. Madden, M. D., *Dublin Journ. Med. Sci.*, 1882.

has taken place is a certain amount of inflammation in the neighboring cellular tissue or in the pelvic peritoneum, in the veins of the pelvis or in the lymphatics.

These inflammations which take place after childbearing are now usually recognized as septicæmic, but still the idea is not sufficiently widespread that they commonly originate in a solution of continuity of the cervix or of adjacent parts.[1]

It is the generally received notion that the lochia have undergone a putrefactive change, and have in part been absorbed by the lymphatics, or that there has been a primary inflammation of the plexuses of veins, a phlebitis which has extended to the cellular tissue surrounding other plexuses; or, again, that a part of the internal surface of the uterus has sloughed, or that a retained clot has broken down, and so has given rise to the inflammatory or septicæmic symptoms.[2] This may all be true, and undoubtedly often is the case. It is generally a surmise, however, since there is nothing in these symptoms to establish whence the trouble comes; and there can be no question, judging from the frequency of this lesion accompanying a history of such inflammatory complications after confinement, that many and many a case has the wrong cause assigned to it; in other words, that many cases of laceration of the cervix pass unnoticed even though clearly indicated by these very signs of pelvic trouble.

When such an inflammation is in process of development we have evidence of the mischief in some slight pain in the hypogastric region, right or left—more usually the left, because of the greater frequency of injury on that side and an elevation of temperature of one, two, or three degrees, depending on the virulence of the poison and the amount absorbed.

If we now make a digital examination, we may learn positively how this new element has entered into the case. One need not dread being a source of infection: the symptoms point clearly to such an agency being already at work, and our business is to learn whence it arises and how to get rid of it.

Even when aseptic injections have reached the cavity of the womb they frequently fail to reach the source of infection. The finger in the vagina will give us unerring guidance to the cause of trouble by apprising us of the condition of the parts immediately involved in labor, as

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[1] "How numerous are the cases of puerperal fever treated to-day with but a feeble appreciation of the true origin of the disease!" . . . . "In how many such cases are the passages explored with a view to the direct application of remedies to the torn cervix, so often the sole origin of the disease!"—W. M. Polk, M. D., in article "Can Lacerations of the Cervix uteri be Prevented?" *Trans. Am. Gyn. Soc.*, Philada., 1881, p. 407.

[2] See *Amer. Journ. Obstet.*, 1882, p. 49: "On Antiseptic Midwifery and Septicæmia in Midwifery," by Robert Barnes, M. D., F. R. C. P.

well as of those less directly concerned, but nevertheless suffering from putrid absorption. In this way we may recognize a sloughing surface or mass, possibly involving a large portion of one lip of the cervix. This knowledge will enable us to treat more directly than heretofore, or even to effect a radical cure by removing the mass. Although exceedingly foul clots are sometimes expelled from the uterus days after labor, which have not given rise to any appreciable disturbance, yet we are not thereby justified in allowing such a clot to remain when we are sure of its presence.

In some cases all sinuses will be closed, and absorption therefore slow; in others trouble will arise from activity of the capillary circulation and abundance of lymphatics. The finger may detect small chains of hardened bodies running from the cervix to lateral portions of the pelvis or in an anterior or posterior direction. These lymphatic vessels, filled already to excess and themselves inflamed, carry both poison and products of inflammation to the larger reservoirs, the lymphatic glands. Here we find more induration and general thickening, in patches, in nodules, or even diffused throughout the surrounding cellular tissue.

When inflammation has once invaded this region, it travels rapidly and causes marked and widespread induration. The uterus is consequently crowded in the pelvis to the side opposite to that in which the cellulitis exists. In case of a severe inflammation involving both sides the uterus will be generally carried down in the median line. Such symptoms, however, do not belong to the early stages of mild cellulitis; before they occur we receive warning from well-marked constitutional disturbances. These symptoms may vary in degree and in the position of their occurrence. If we find less fulness associated with greater hardness in a higher plane, and much more tenderness on pressure, we are justified in diagnosing an involvement of the peritoneum, either alone or with the cellular tissue. The lymphatics reaching the peritoneum, rather than those terminating in the cellular tissue, are here chargeable with the conveyance of the poison. There will have been high temperature—103° and 104°—full tense pulse, dry hot skin, dry tongue, more pain in abdomen on one side or both, tendency to urinate more frequently, and, probably, cessation of the lochia.

From this point on the inflammation may follow any one of the different courses open to it. It may subside, cease at the point of lymph-exudation, undergo resolution, or be carried to the point of suppuration.

To deal with all these possibilities would be but to repeat the whole clinical history of adeno-lymphangitis, pelvic cellulitis, and pelvic peritonitis, which have been treated of elsewhere in this work. It will suffice to take up the one condition which has more especially to do with our subject as a complication, when the case has passed this lying-in period; otherwise, we should still have to consider abscess of the

ovary as well, even phlegmasia alba dolens, since it also may be a complication if not a consequence.

Fixation of the uterus, to which I refer, is scarcely a distinct affection, since it may result from any of these inflammations. It complicates a large number of cases manifesting even a moderate laceration of the cervix. It is produced sometimes by a cord running off into the cellular tissue: this may be in part the trace of a laceration through the vaginal wall which has left a cicatrix. This is a particularly troublesome result of laceration through the posterior lip, as it results in incurable retroversion. Again, the cause of fixation may be found in a chain of lymphatics choked and permanently indurated, or in an induration of the cellular tissue itself. Such a hardening may extend up one side of the uterus beyond our reach, and may be regarded as a thickening and adhesion of the opposed surfaces of the peritoneum forming the broad ligament. When posterior to the womb it may indicate thickening of the utero-sacral ligaments.

Whatever may be its nature, this affection generally yields to appropriate treatment long continued; yet we sometimes find it a most persistent complication which forbids our interference by its painful character, though we may occasionally be forced to disregard its persistency, and even to operate.

Another complication more directly referable to the subject under consideration is menstruation irregular both as to time and quantity, the menses being disposed to recur too often and to last too long.

As these two conditions—namely, metrorrhagia and menorrhagia—are but symptoms after all, we may at once go to the cause and consider the bearing of the laceration of the cervix upon them.

We know that the uterus has never resumed its original proportions; that in consequence the flow of blood has constantly been too great toward it; that an excessive quantity has been retained by it; and we can readily see how an excessive growth should be induced thereby. Likewise, areolar hyperplasia, assuredly a result of excessive nutrition, leads to the formation of granulations and mucous polypi from an abnormal development of the glandular tissue of the canal.

These are the growths which give rise to the excessive monthly flow, and they assume very great importance as complicating the lesion we have before us. They give rise to it, indeed, and yet are not solely responsible for it; the uterus itself plays a considerable part in its production.

From the very first after the injury has taken place, if the organ does not undergo the involution which is natural, the character of tissue remains more or less unchanged, the sinuses large, and the organ turgid; it cannot contract upon itself or upon its vessels, nor are its vessels indeed in a condition to contract spontaneously; consequently, when,

at the menstrual epoch, the broken-down cells are thrown off from the endometrium, the inert tissue, with fatty vessels back of it, still continues to bleed; and this is still more marked when villi have developed on the surface, forming the fungosities. Increased vascular supply and increased bleeding surface are the result.

This enlarged uterus in the condition of subinvolution is one of the most formidable complications we have to deal with. From its weight it falls laterally, anteriorly or posteriorly, settling down so far as to become a pathological displacement, sometimes even protruding from the vulva. The lower it sinks, the greater the tension on its vessels, and the greater the consequent diminution in their calibre and in the blood-supply they convey. The woman may experience but little discomfort, since the parts may have become accustomed to the strain. Replacement of the uterus obviously allows these overstretched vessels to gather upon themselves, to fill, and to allow the parenchyma of the organ to do likewise, and we actually cause more distress than before. Those who lack experience in the management of these cases have occasionally secured the previous degree of comfort by pushing the uterus very high, and thus repeating the pathological stretching and narrowing of the vessels.

This argument may seem opposed to certain facts well known to gynæcologists in regard to this very elevation or depression of the uterus, which have always to be borne in mind when sustaining or supporting it—namely, that the depression below a certain line or the elevation above a certain plane will cause discomfort rather than a feeling of ease. It is only a matter of degree, for if the variation from the health line be slight in either direction, discomfort will result. The veins, being more yielding than the arteries, first diminish, and by impeding the return of an undiminished supply of blood cause passive congestion and pain. The drag of the uterus upon the other organs of the pelvis, the ovaries and tubes, the bladder and rectum, and its interference with their functions, are additional sources of disturbance, entailing fresh complications—namely, excessive pelvic pain, irritable bladder, and hemorrhoids.

Induced sterility is a very serious complication of lacerated cervix, often overlooked on account of insufficient familiarity with the subject. It is only too common for the practitioner to try to cure endometritis, endocervicitis, uterine catarrh, and similar troubles without attempting to find their cause. Indirectly, it is true, but by an unmistakable sequence, a discharge is established in the uterine canal, and during its persistence impregnation cannot occur. Elsewhere in this paper we have seen the mechanism and nature of the morbid process, and in the section on Treatment the method of overcoming the difficulty is detailed.

Still another important complication to consider is that of inability

to carry, the liability of the woman to abort.[1]   This tendency is not present in every case, of course, nor can it be definitely stated to what exact degree the laceration need extend to render the cervix incapable of furnishing the proper support to a developing ovum. We meet with so many cases of constantly recurring miscarriages in women in whom nothing else is at fault that, discovering this lesion, it seems but fair to attribute the one to the other ; and this reasoning cannot be gainsaid in cases in which, after repeated mishaps—usually toward the third month —this inference has led to an operation for repair of the cervix, followed by a delivery at term.[2]

Many cases which come under our notice are palpably unfit to furnish the necessary support, notably those in which the tear has extended well up into the broad ligament on one side or both, and has not healed to any great extent. There are others, again, in which, on the external surface of the cervix, there is perhaps no trace of a laceration, and yet miscarriages will constantly occur. Such instances would seem difficult of explanation, and to many our interpretation might seem entirely incorrect, were it not that we can still demonstrate that a marked and deep laceration exists *within* the cervix. Such a tear may be circular or circumferentially linear, or it may be longitudinal and concealed, nothing visible indicating an entire division of the inner os or of the whole length of the cervix down to the external os, which is either intact or merely closed at the mucous membrane. Occasionally these cases become pregnant, and require such management as the circumstances may indicate.

There are still other complications in the way of various neuralgias, apart from the ordinary pain due to the presence of cicatricial tissue in the angle of the wound or over the surfaces of the rent, which has failed to heal.[3] Nor does the nervous element exhibit itself in the way of neuralgia alone, but in every kind of neurosis as well, disturbance of innervation leading to the most varied reflex forms of disease. Every general practitioner will recall cases exhibiting various and changing ailments which he could neither explain, relieve, nor cure. Among these symptoms we may mention a neuralgia about the head or face, persistent, not dependent on cold, local injury, imperfect teeth, inflamed ear, or constitutional diathesis; a painful eye or affected sight, not due to any appreciable local lesion or loss of power ; a toothache,

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[1] See *Chicago Med. Gazette*, 1880, i. p. 46, S. V. Clevenger, M. D.: " Lacerated Cervix uteri a Probable Cause of Recurring Abortion." ·

[2] See *Med. News*, Philada., 1883, xlii. p. 225, case reported by Dr. B. F. Baer, in his " Analysis of Twenty-seven Operations for Restoration of the Lacerated Cervix," of repeated abortions evidently due to this lesion. Op., subsequent pregnancy, carrying to term.

[3] See *Med. Record*, New York, 1879, xvi. p. 529, Dr. T. Gaillard Thomas : " Pelvic Neuralgia due to Laceration of the Cervix."

most constant, without special exacerbations and also with perfectly sound teeth.

The many and almost daily instances of impaired mental powers, of the change of disposition from gay to sad, of acquired irritable temperament, of loss of enthusiasm for occupations or pursuits which were formerly engrossing, broken rest and bad dreams, are only samples of the many disturbances which at times we find are referable to this lesion. Yet we do well, also, to keep in mind Dr. W. Goodell's remark in the *American Journal of Obstetrics*, Jan., 1882 ("Notes of One Hundred and Thirteen Cases of Operation for Laceration of the Cervix"), "that nervous exhaustion and spinal irritation will evoke symptoms which others, as well as myself, have referred to slight cervical tears, but which are in no wise dependent on these lesions."[2]

Vesico-vaginal and Vesico-cervical Fistulæ.—Although the antero-posterior lacerations of the cervix are said to be the most frequent, yet they are not the most common forms met with, for the reason that they heal very readily and leave but a linear trace to identify them. The supply of lymphatics is not as great in this position as in the lateral portions of the cervix; therefore, even though septic material may be in the neighborhood after the occurrence of such a lesion, it cannot be so readily taken up to interfere with primary union of these parts.

It occasionally happens, however, that the cervix is very extensively lacerated in the median line, even through its entire length and thickness, the rent extending into the base of the bladder. This injury may also heal, and commonly does to a great extent; but sometimes the constant passage of water over the edges of the wound, and especially the deposit thereon of phosphates from the urine, will prevent perfect union; in which case we discover the laceration complicated by a vesico-vaginal fistula, or, in another case, the lips of the cervix will close up

[1] See P. F. Mundé, in *Am. Journ. Obstet.*, New York, 1882, xv. 909–911: "Hemicrania and Sciatica depending on Laceration of the Cervix and Chronic Pelvic Cellulitis; cure by Local Galvanization and Operation."

The same: "Reflex Syncope produced by Pressure on the Cicatricial Plug of a Lacerated Cervix; cure by Trachelorrhaphy." *ibid.*, 1882, xv. 907–909.

Dr. H. W. Longyear, *ibid.*, 1883, xvi. 25, 28: "Persistent Salivation apparently due to Laceration of the Cervix uteri; operation, cure."

Dr. R. S. Sutton, in *Transactions of the American Gynecological Soc.*, 1880: "Case of Cataleptic Convulsions cured by Trachelorrhaphy."

Dr. T. A. Emmet, in *Principles and Practice of Gynecology*, 1884, p. 488 *et seq.*: "Facial and Intestinal Neuralgias."

"Cases of Laceration of the Cervix uteri, with Unique Symptoms" (some reflex and others due to attendant inflammation), by C. M. Wilson, M. D., in *New York Med. Journ.*, 1886, xliii. 220.

"Epilepsy dependent on Erosions of the Cervix." Engelmann, *St. Louis Clin. Rec.*, p. 28. He refers also to his own article on the hystero-neuroses in *Trans. of the Amer. Gynec. Soc.*, vol. ii. 1887; also to similar cases reported by Dr. I. M. McWhorter in *Trans. of the Med. Soc. of West Virginia*, 1877, p. 308.

to the deep angle, leaving, however, a sinus which connects with the bladder, forming there a vesico-cervical fistula.

Every variety as to shape of such cervices may be met with, particularly as such extensive injuries arise from sloughing, in which case the resulting cicatricial tissue distorts the parts, so that frequently what we may take to be a lateral laceration of the cervix with a vesico-vaginal fistula is, in fact, an anterior laceration through the base of the bladder, and *vice versâ*.

Dr. T. A. Emmet in his work on vesico-vaginal fistula[1] gives numerous instances of this variety of laceration of the cervix; and the reader will profit more by studying such cases in their original record than by means of a synopsis. It is here sufficient to say that these lacerations are to be dealt with in precisely the manner detailed for the operation in general, especial care being taken to denude to the extreme depth of the angle and to bear in mind the requirements of the fistula.

In the case of a partially-healed laceration leaving a passage for urine, it becomes necessary to slit through the cervix; in other words, to re-establish the lesion, so that we may thus denude the fistulous opening thoroughly and secure union from the bottom.

A last complication to mention is epithelioma fastened upon a lacerated cervix. If early, the laceration can generally be detected by the great fulness and rolling out of the cervical mucous membrane, the new disease showing itself in this situation first.

Even during active sexual life there is a tendency to this pathological change, which is in a great measure favored by the abundant blood-supply accompanying the conditions attendant on this lesion; and it is still more to be feared at a time when there is a retrograde change in cell-growth—namely, at the menopause if the constitution be at all impaired by previous illness. This same condition of ill-nutrition may prevail before the senile change comes on; especially is this the case as regards cicatrices, and it is often upon these that we first see the establishment of malignant disease.

DIAGNOSIS.—There are three means of making a diagnosis of laceration of the cervix: we may arrive at it inferentially from the history furnished by the patient, or by the touch, or, again, by ocular inspection.

The first mentioned will scarcely prove serviceable to those only moderately familiar with women's ailments. The older practitioner or one devoting himself more specially to gynecology, however, cannot fail to have so vivid an impression of the association of subjective symptoms that unmistakably he will make a fairly correct analysis of the case without having to prosecute his search for evidence farther.

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[1] *Vesico-vaginal Fistula from Parturition and Other Causes,* T. A. Emmet, M. D., New York, 1868.

The physician should not, however, content himself with this method. It frequently happens that a most extensive injury presents no symptoms, the woman herself remaining in fortunate ignorance of the lesion, and therefore failing to call attention to a matter which will most assuredly demand remedial measures sooner or later. Then, again, though the physician should infer the existence of such a condition from the symptoms, it is imperative that he should not stop there, for the question as to the most appropriate local treatment at once arises. A digital examination is therefore demanded when there is reason to suspect such a condition.

It is occasionally possible, immediately after labor, to determine by the touch that a laceration has taken place; such will be the case, more especially, when the cervix has been enormously congested and pinched, so that the lips show a great thickness even after the compression has been removed, or it may be that a flap is pendent. Here the rent would appear larger than it really is because of this thickening. Should the laceration, however, be stellate or internal, no evidence of it can be obtained in this way, unless, indeed, the clefts be markedly deep. As a rule, the cervix after labor offers to the touch such a decidedly mushy feel—is, in fact, so spongy and soft—that one is mostly content to leave it to Nature to be restored before feeling confident of any positive fissures or tears.

This being stated, it seems unnecessary to dwell upon the question of ocular inspection, for it will be evident to all that in such cases the speculum will tell us nothing that the experienced finger has failed to establish,[1] nor will it be necessary to make use of this method of diagnosis at such a time, unless, in a very exceptional case, we may be called upon to pass a suture to control an otherwise uncontrollable hemorrhage.[2]

If this same case runs on for four or six months longer without healing, these same methods of exploration will reveal to us something very much more positive. The finger within the vagina will then almost surely find the uterus rather low in the pelvis. The cervix will feel decidedly larger than it should be following a strictly normal labor, but the consistency will be much softer. The touch will appreciate also a velvety condition of the more prominent parts of

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[1] Prof. Karl Schroeder in his *Lehrbuch der Geburtshülfe, etc.*, Bonn, 1884, p. 693, recommends drawing and crowding the uterus down to the vulva for inspection, and, if necessary, for operation directly after labor. I cannot think this advisable: such displacement of the uterus, with a possibility of rupturing vessels, is undesirable, and the use of even Muzeux's forceps is sure to wound and lacerate the congested lips of the cervix still further. It is far better to place the patient on the side, and by the aid of Sims' speculum to do whatever is necessary—pass a single suture or close the entire wound.

[2] Dr. Montrose A. Pallen was the first to stitch a torn cervix immediately after labor to arrest hemorrhage. His account of two successful cases is published in the *Richmond and Louisville Journal* for 1874.

the cervix, and possibly the main portion of these velvety patches will be a trifle raised, so that the finger can distinguish rather accurately the defining border. This condition indicates the constantly accompanying erosion.

In feeling for the os uteri we shall recognize that it is no longer slightly elliptical, but that it is either very much elongated, broken up in sections (stellate), or that it is not at the crown of the cervix, but has completely disappeared. In the first case the laceration will be a comparatively slight one, possibly confined to the lower portion of the canal, either unilateral, bilateral, or involving the anterior or posterior lip. This, however, is not absolutely certain, and we must not allow ourselves to pronounce positively on this point without pushing the investigation farther (Plates I. and II.).[1]

There are cases in which the os externum appears even perfect, in which, with care, we may detect a most extensive laceration within the canal, either longitudinal or transverse, possibly even circular. These are the cases which are most commonly overlooked. If we happen to see the woman a couple of months after confinement, what may have been a rupture of the external os has already united and presents a normal appearance, while the inner tear, for various reasons, has not had the opportunity to heal, and, if not treated, will always remain a concealed pouch. Now, in such an instance, where a lesion of this kind seems probable, we shall be enabled to make out the exact state of affairs by the use of the uterine sound, which will, after entering a possible "pinhole os," find itself in a comparatively open space; and, furthermore, in drawing it down from within that portion of the uterine canal which is known to be sound, a very perceptible jog or shoulder will be felt on either side at the upper portion of the rent.

In another phase of this rectilinear tear, the os being markedly open from side to side, we may be able to pass the finger-tip up into the cervix, no part of the original injury having healed since its occurrence. The stellate laceration will be made evident to the touch by the recognition of numerous nodules, the interspaces of the various rents.

In these cases there is rarely more to be found than is indicated by our first touch: appreciating a given amount of injury in various places at the crown of the cervix, we realize that fissures thus traced must travel up just about so far in the length of the cervix before finding their limit ; and so we may always feel very certain that the injury within is no less than it appears on the surface.

The third form—that in which the whole os has disappeared—

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[1] Plates from Dr. P. F. Mundé's article in *Am. Journ. Obstet.*, New York, 1879, xii. 117–134, entitled "The Indications for Hystero-trachelorraphy, or the Operation for Laceration of the Cervix uteri," with my own interpretation of conditions represented.

Plate I.

Granular erosion of cervix.
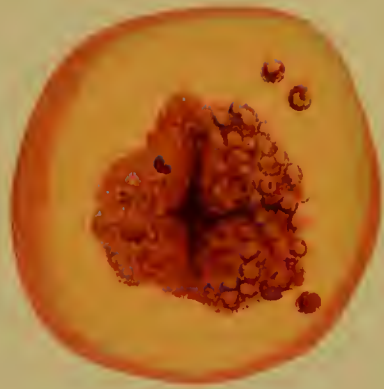
Cystic degeneration
after laceration.
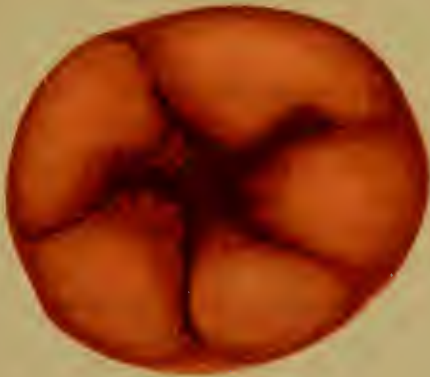
Deep stellate laceration.

Stellate laceration with
ectropium and cystic disease.

Crescentic laceration
with erosion of one lip.
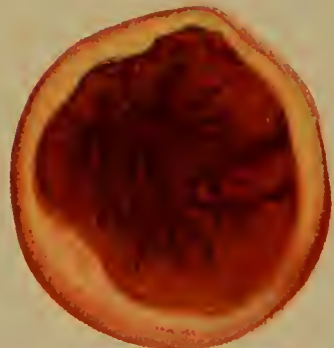
Deep destructive laceration
up to inner os.

Laceration of Cervix.

Plate II.

Unilateral laceration
beyond vaginal insertion .

Stellate fissure
with erosion .

Double laceration
with erosion .

Double laceration
beyond vaginal junction
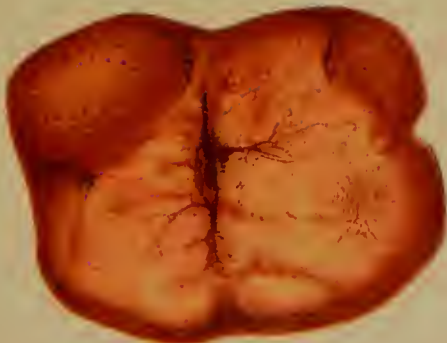
Bilateral laceration
great erosion and
cicatricial induration .
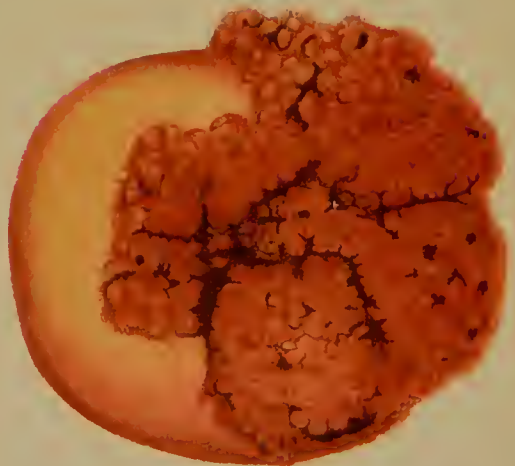
Cystic disease implanted
on lacerated cervix, simulating
cauliflower growth .

Laceration of Cervix

bespeaks a frightful amount of injury, not only of laceration, but of sloughing as well, unless it be one of those rare cases of transverse laceration in which a complete ring of cervix has been torn from the body of the uterus. Or, again, the tear may not have been confined to the cervix, but may have extended in one or more directions into the vaginal walls, leaving a huge cleft.

Continuing the digital examination, we shall be able to determine whether the os, or the opening resulting from the tear which represents the os, is in the median line or at one side. Unless the laceration has been bilateral, and equally deep on both sides, the os will probably be found displaced. Of course, it is impossible, without other methods of examination, to find out how much this deviation may be due to the amount or location of the injury, and how much to a corresponding deviation of the uterus. This we accomplish by bimanual palpation or by the aid of the sound introduced into the uterus. If by these methods we find the body of the uterus lying toward the same side as that on which the os appears to be, we may positively make a diagnosis of cervical injury of that side. Should the uterus tip to the side opposed to that toward which the os points, we shall hesitate and argue rather that the uterus or its appendages are at fault, for, in truth, though it may happen that the uterus be so misplaced in relation to a lacerated cervix, yet it must be from an infrequent combination of circumstances, such as a development of acute peritonitis following the injury, and more marked on the opposite side, so that it binds the uterus in that direction ; or, again, from the presence of a fibroid on the side opposed to the injury, which also would throw the fundus over.

These two points are important ones to bear in mind, and of course have to be considered in making the diagnosis clear, as it is evident that the same conditions may be present on the same side as the deviating os, and yet must stand for nothing as bearing on our diagnosis of laceration of that side.

Should there be an enlarged cervix, we seek to establish its bearing on the question of diagnosis, and though at an early stage this feature is not as marked as it will become later, yet, while in process of formation, a skilled finger will detect it and give it its true significance.

In passing the finger around the cervix at the level of the os internum—that is, by pushing up the vagina against the uterine body—one can appreciate that the supravaginal portion of the neck is considerably smaller than the infravaginal. The latter is swollen, and, compared with that above, has a mushroom-like feel. The edges of this " mushroom " may sometimes be caught from above by the finger-tip and rolled forward toward the os uteri ; at other times they are too firm and resisting, and one may only feel them *in situ.*

When once rolled over and brought down like flaps, even the touch

can appreciate at once that this enlargement is not real. These edges, turned down from all sides, will now not make the volume that was apparent before. In fact, by restoring them to their natural position, we have but their own thickness, while it was double when they were turned back on themselves.

This increase of size, we have seen also, is attributable to the attendant engorgement due to the sagging of the uterus, this, again, being dependent on the size and weight of the organ.

There is also the frequently accompanying pelvic inflammation, which acts like a constricting ring about the cervix at the vaginal junction, thus making the inner soft parts roll out in the same way as in simple cases of pelvic inflammation without cervical lesion. In addition, we have a certain amount of cystic disease already formed, which contributes to the enlargement.

There is still something that the finger may detect even thus early after the injury has been received, and that is the sharp edge at the termination of the wound or at the point at which healing has ceased. Carrying the finger on beyond this point, we may often trace the course of the injury even on to the vaginal walls and in the thickness of the broad ligament. These cicatricial lines and others resulting from sloughing will put our mind on the alert when, otherwise, the case might not seem so clear.

Now, if at this stage we seek for an elucidation of the case by the aid of the eye, we may note some features which are at once characteristic and diagnostic.

We must be careful not to overlook the very lines we have been considering, as we might readily do on account of their exceeding faintness. If due to multiple tears in the tissues, they will appear like little scattered mother-of-pearl threads; if due to a single laceration and line of repair, only a single line will appear. Furthermore, we shall see the enlarged and engorged cervix, dark colored if the sagging and congestion have been great or if the examination is made shortly after labor. We shall see the os just as we have felt it, either natural in case of a concealed laceration, slightly or much enlarged, or stellate or obliterated; perhaps displaced toward one side or the other of the vagina, and the inner part of the cervix probably beginning to roll out somewhat, because of the solution of continuity. This inner portion will present a reddened surface much akin to the normal interior of the cervix, except that, being pinched somewhat, it is also congested, and the full capillaries can be traced over the surface. In many cases, when the injury has been extensive, the arbor vitæ shows plainly, the rugæ being more marked than in their normal condition, also because of the above-mentioned engorgement.

Within the os will be seen more or less of a discharge, thicker and

more tenacious the farther the case has progressed. This is habitually so firm and adherent that it can only be removed with the greatest difficulty, and often at the expense of the underlying surfaces, as they have to be rather harshly rubbed before they will yield up this mucus from the open mouths of their glands. After removing this discharge —or, possibly, even without disturbing it—we may come upon a rose-colored patch of varying size extending from within the patulous os tincæ on to the crown or outer edge of the cervix. This is the surface which we recognized by the finger as velvety and considerably softer than the surrounding part. Its coloring is brighter at its central portion than at its outer border. The middle portion is also dotted with small elevations, quite discernible by the naked eye because they catch the light and show as brilliant spots. These are the enlarged villi in the midst of the erosion. The enlarged capillaries running through it may also be recognized.

After inspecting it for a few moments one may notice that it loses its bright-red color and becomes much more pink. This effect is temporary only, yet it goes far to prove that there is no destruction of tissue, and that we are not dealing with anything like an inflammatory ulcer. In fact, the exposure to the air accomplishes not only this, but its astringent effect is also to reduce the fulness of the erosion, so that it quickly assumes the same level as the neighboring parts.

Now, to complete the diagnosis it only remains to seize the cervix with tenacula and to seek to form the normal os. The case being recent, the lips are not yet much thickened and hardened, and there has not yet been any great development of cystic disease, so that this manipulation will prove most simple and easy. The relation of the parts will at once be established, and it will be evident beyond a doubt that there has been a solution of continuity.

If there has been sloughing of the parts and loss of substance, the case will assume a different aspect from what it would in a simple laceration. The same is true if the cicatricial bands are many and are beginning to contract and draw the parts out of shape. In such cases we find the cervix, or what remains of it, flush with the vaginal roof, partially buried under a vaginal fold, bound down to one part or another of the vagina, according to the formation of cicatricial bands, or even twisted on its own axis, so that what is really a transverse laceration appears to be antero-posterior, and *vice versâ*.

There remains but little to be said of the chronic form, in which the laceration is old and well established, except that the diagnostic signs grow more marked with the passage of time. Physical exploration at this advanced stage will reveal characters not yet fully developed in the earlier type. We now find, on introducing the finger, that the cervix is very large; it is flattened out and the mushroom effect is still more

positive; the finger can, in most cases of extensive laceration, be abso-
lutely hooked over the edge. If we call bimanual palpation to our aid,
we recognize that it is not alone the cervix which is large, but that the
entire organ is much beyond its normal size. The body will be found
large, flattened antero-posteriorly, and, if there has been no inflamma-
tory complication, wabbling about or retroverted. Commonly, it can
be shifted readily from one position to another, the ligaments being so
lax that they have little or no hold upon it.

On feeling for the os we may recognize nothing but a great slit
directed probably against the vaginal wall, to one side or the other.

If the injury has been marked, we find a hardened line running out
from the present limit of the breach into the thickness of the base of
the broad ligament, and, possibly, the cervix will be tightly bound
over to that side. This also has the effect of dragging the uterus down
in the pelvis, independently of its size.

The finger may be easily passed into the uterine canal, and some-
times it is so gaping as to admit fully the first phalanx. The inner
face of the cervix will be felt soft and velvety, and it bleeds on slight
provocation. This same condition will, in some cases, be found to
reach the vaginal portion, depending much on the amount of acrid
discharge and on the amount of prolapsus.

The condition of granulation and erosion is therefore much more
marked than in the earlier stages.

Other cases, again, will give a hard, bossed, uneven surface, firm,
resisting, yet elastic. This will readily be recognized as composed of
multiple elevations, being made up of the distended follicles of the
cervical mucous membrane; in other words, it presents the condition
of cystic disease commonly accompanying and forming a part of these
cases of laceration. The older the case, the more numerous will these
cysts be, though not, of necessity, the larger. Those appearing early
are rather the greater in size; as the case proceeds, the larger ones rup-
turing, a considerable number of small ones develop and crowd the
mucous membrane, making it feel like a nutmeg-grater.

If at this period of formation we insert the speculum and inspect
the parts, we find conditions very similar to those detailed above, yet
intensified. For instance, the lips will appear more thoroughly rolled
out and the everted mucous membrane puffed. The tissues are much
more firm and less friable; if handled with a tenaculum, except for
the granulations and erosion, they do not bleed as profusely as they
would in a less chronic case; and, by the same means, we find that the
lips, if the parts have been the seat of cystic disease, cannot be as read-
ily rolled in as formerly; it is no longer as easy to shape the cervix so
as to present anything of a normal os.

Other cases, again, reaching this stage, will appear much less import-

ant than less chronic ones, because of the more advanced disease and subsequent atrophy of the cervix, which for this reason seems much more shapely.

Differential Diagnosis.—As the exact diagnosis of this condition is not always an easy matter, so also are there some difficulties presented in differentiating it from other pathological states.

The most common lesion with which it may be confounded is eversion and erosion, due simply to a chronic pelvic inflammation.

Just as we see this condition brought about when a solution of continuity does exist, engendered to a great extent by the attendant or subsequent pelvic engorgement and inflammation, so it is produced without any laceration. In many cases it is exceedingly difficult to determine which condition exists; and the physician is inclined to suspect a patient of attempting to conceal a past conception. On the other hand, he may be surprised at his own faulty judgment when he sees the cervix resume its natural appearance on appropriate treatment, all signs of laceration disappearing as the uterus is allowed to rise in the pelvis, thereby being relieved of engorgement. An important point in differential diagnosis is the absence of any trace of a cicatrix, though, it is true, a woman who has borne a child may present the appearance of a cicatrix, in which case the rolling out is perfectly parallel and glandular; hypertrophy is not so common, yet the cervical catarrh is most marked. The absence of a cicatrix therefore remains as a valuable piece of negative evidence.

A second condition with which laceration may be confounded is malignant disease of the cervix, since the habitual development of the gland-structure imparts to it at one time a hard, nodulated surface, at another, particularly if the villous hypertrophy be marked, a soft, velvety feel, which inspection shows as a red congested mass, sometimes of enormous size, bleeding readily on pressure, and often breaking down. Such is the condition which Dr. Robert Ellis, obstetric surgeon to Chelsea Hospital and Belgrave Dispensary, in *London Lancet*, 1861, vol. ii. p. 83, describes as "the fungous ulcer." He says that in some hundreds of women he could not recall a single case of its occurrence in one who had not been pregnant. He describes it thus:[1] "Cervix soft, large, spongy to the touch; os wide open, so as to admit the finger; ulcer large, pale, studded with large and friable granulations; discharge, a glairy, brownish mucus, frequently deeply tinged with blood."

The temptation to destroy this surface, even if epitheliomatous, may lead to the discovery of the true condition, since the separated lips may be approached and the cervix give promise of full restoration to its normal shape. Such could not be the case were there a develop-

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[1] *Lancet*, 1862, vol. i.

ment of malignant disease without solution of continuity. To determine the matter apart from the test just mentioned, we must consider the condition of the general health, for with malignant disease advanced to the point which such a mass would imply some cachexia would probably have already been established.

We must not lose sight of the fact, either, that this condition of excessive villous growth, though benign at the first, may assume unhealthy action and become malignant. Sometimes the border-line is very indistinct.

Finally, the microscope comes into play to determine whether the condition be one of excessive proliferation merely, or whether the cell-type has changed.

In the *Lancet* (London) for 1873, vol. ii. p. 811, we find the following: "At a meeting of the Royal Medical and Chirurgical Society, held Nov., 1872, Dr. Arnott said that during the last two or three years he had had two or three opportunities of examining snippings of 'cauliflower' growths from the os uteri, given him by Dr. Barnes. He had found them nothing but ordinary villous outgrowths, branched, club-shaped villi, covered by columnar epithelium."

"In the malignant growth with villous processes there is the course of cancer, but in the simple villous growth the general signs of malignancy are produced by the drain on the system through the constant discharge and loss of blood."[1]

PROGNOSIS.—In treating of this division of our subject it would manifestly be a grave error to draw too dark a picture of the evils resulting from a laceration of the cervix, just as it is a manifest error on the part of many general practitioners to disregard the question of evils to come and to treat lightly any existing lesion, confident that the case will take care of itself, and that mothers of to-day will get along just as well as their mothers and grandmothers did before them.

There is a medium view to be taken, or, rather, it is more correct to state that many cases of even extreme injury will pass through the years of childbearing life and through the menopause without exhibiting any perceptible harmful effect; and, on the other hand, the gynecologist is every day surprised to find the potent influence for evil exercised over the general economy by a seemingly trifling injury, or at the wondrous complications that may arise in consequence of an apparently insignificant lesion.

Presumably, there will always remain a difference of opinion as to the interdependence of certain features connected with any given case,

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[1] See *Am. Journ. Obstet.*, New York, 1882, xv., Suppl. 48, Dr. C. H. Thomas: "Laceration of the Cervix uteri simulating Cauliflower Excrescence for Fifteen Years; cure."

but all will surely admit that the gynecologist is the most competent to trace the bearing of one event on the other, and may be allowed to speak authoritatively on the subject.

In regard to prognosis we must take into account both those cases which have been left entirely to themselves and those which have had the benefit of care and treatment.

Taking, first, a case of laceration of average extent which has been entirely overlooked or ignored, what is likely to be the outcome of it? We may almost review our symptomatology and our pathological anatomy in mentioning the successive steps from health to invalidism which such a case travels. From the first there may be leucorrhœa, with erosion and eversion, the leucorrhœa being a persistent drain on the system, impoverishing the blood and opening the door for a succession of ailments due to malnutrition. There may be subinvolution with retroversion, prolapsus, or procidentia. The displaced uterus, carrying down the uterine appendages, will entail new suffering. The bladder will be dragged down, predisposing to cystitis and to the formation of calculi; besides which, the rectum being dragged upon, hemorrhoids and obstinate constipation will be induced. Dyspepsia, neuralgia, and various other reflex disturbances are almost constantly met with. All these symptoms may be so intensified that they become almost new diseases superadded to the old affection.

Looking at the laceration now simply as a solution of continuity, leaving out of the question the complications entailed, we have to deal with the results prone to arise from the constant irritation to which the exposed flaps are subject. Even though an ill result should happen only once in a hundred cases, we should not be justified thereby in neglecting proper precautions.

The exceedingly low vitality of such a part, and especially of the cicatrix, renders it liable to unhealthy action, not only when there is a reddened, raw, granular surface, but even when the surface of the flaps has been unbroken. The inevitable retrograde change in the tissues occurring at the menopause sometimes leads to improper cell-formation and carcinoma.[1] It is well, therefore, to advise a reparative operation or amputation in all cases of even moderate laceration when accompanied with marked eversion, or when with moderate eversion we find thickened lips filled with broken-down cysts and complicated with reduced vitality, or again in anticipation of the menopause, when, as we know, the vitality will be at its lowest.

We must next consider those cases which have received all the benefits of skilled attention.

If the case has been treated in a palliative manner—that is, if the

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[1] "The Importance of the Cicatricial Ectropion of the Cervix and the Operative Treatment after Emmet's Method," Breisky: *Wien. med. Wochenschr.*, 1876.

erosion has been healed, the cysts emptied, the uterus raised in the pelvis, and all surrounding inflammatory action has been removed—there will seem to be a very good promise of continued well-being for such a uterus. Virtually, a cure has been effected, and the great difficulty consists in maintaining the condition at that point. Were this possible, few, if any, operations would be necessary. The trouble is, that as soon as treatment ceases the old conditions are restored and the old symptoms reappear.

Again, if a case has been virtually cured, and then operated upon to secure all the benefit so far attained, what is the promise for continued good health so far as the uterus is concerned?

In the first place, we may say, in regard to sterility and carrying to term, that in the large majority of properly-performed operations a decided success has been achieved.[1] Besides affections, such as prolapsus, cystocele, etc., which accompany the main lesion and yet require independent attention, we have to deal with symptoms dependent upon the cervical operation itself.

All of those referable to the presence of cicatricial tissue in the cervix have been overcome, and will, for all time, remain cured if the operation has been well and thoroughly done; those referable to the disease of the glandular structure will occasionally persist for some considerable time—that is, until the uterus has felt the benefit of the operation by being diminished in size and weight. Even then the cervical catarrh may remain troublesome and call for more energetic treatment than has hitherto been applied. Cystic disease likewise is apt to recur even for years after an apparently successful operation. Pouches develop about the os and the crown of the cervix, and by crowding the tissues they awaken neuralgic pains. A recurrence of these cysts does not necessarily imply an incomplete operation for their removal or an imperfect reposition of the everted lips. The disease will occasionally return in spite of the utmost care during operation, and I should regard such a result as showing not only that the condition of follicular disease is at times very much concealed, but also that in some cases this growth of glandular tissue, once begun, continues for an indefinite period, even after operation, and that we cannot get at the very bottom of the evil without removing the entire portion of the cervix which has been involved.

Satisfactory as the operation generally is, we must guard against deceiving ourselves or our patient with undue hope. Some of her sensations and pains will disappear slowly at best; the nervous symptoms will yield only as her strength returns. A markedly long con-

[1] See Dr. B. F. Baer's article in *Med. News*, Philada., 1883, p. 225: "Analysis of Twenty-seven Operations, etc. with reference to effect on Sterility and Labor;" also, Supplement, p. 724.

valescence should not discourage us, since many of our best results have followed months of uncertainty.

TREATMENT OF SUBINVOLUTION.—This affection is so especially dependent on laceration of the cervix that we might be led to expect a cure of the effect from a removal of the cause. Herein we should be disappointed, for this enlarged condition of the uterus, though engendered by the lesion, has become a separate individuality, and many chronic cases will remain hypertrophied indefinitely, or for a long time, in spite of a successful operation for repair of the cervix. Such a procedure is, however, requisite for a radical cure, for although we may succeed in reducing the enlargement, we cannot expect such a result to be permanent.

In the mean time, before the case is fully ready for operation, a great and important reduction can be effected in the size of the organ by preparatory treatment. We must aim to restore the uterus to its normal position in the pelvis and to retain it there by the natural suspension of its ligaments, rather than to bolster it up by an internal plastic procedure or by the external lifting and dragging of Alexander's operation. With so much to effect, and such positive means at hand of accomplishing our purpose, how can it be held that a case of laceration may as well be operated upon as soon as one meets with it, letting all preparation of the parts go unheeded?

One of the first indications to be met, then, is that of raising the uterus to its normal level in the pelvis and of holding it there. This is to be accomplished by freeing the organ from all superabundant weight in the way of clothing fastened about the waist, of pressure from a large abdomen or from an habitually over-distended bladder or rectum.

To effect the change in position we may either raise the organ on the tip of the finger, the woman lying on her back; or it may be better done, still by the finger, the woman having been placed in the semi-prone lateral (Sims') position, so that the intestines may fall toward the diaphragm; or, again, we may accomplish it by placing her in the knee-chest posture.

The organ will change position by its own weight when the patient has been so placed, but we may obtain additional force by allowing air to enter the vagina. Then we maintain it at its normal level by placing cotton pads beneath the cervix or by adjusting a properly-fitting pessary should other conditions of the case allow of its use. We should never lose sight of the importance of holding the uterus at this point while fulfilling all other necessary indications. Much will thus be gained in the way of reducing the size and weight of the uterus.

The instructions given at length in the section devoted to general treatment, if carried out, will also tend in the same direction; but there still remains much to be done.

If the case be one of long standing, in which the uterus is not only engorged periodically, but permanently, and the character of the tissues is changed, with development of connective-tissue elements and thickening of muscular fibres, we shall have to seek to undo these conditions to some extent. In addition to the degree of depletion which we may produce by horizontal rest and saline laxatives, we may be obliged to withdraw blood from the cervix. This we may do by leeches or internal scarification, either of which methods is of great assistance to the general depletion, or even necessary in addition thereto. On account of the absence of valves from the veins we cannot accomplish our purpose permanently by hot-water injections or change of position, for as soon as treatment is suspended the vessels refill almost immediately, and remain so on account of deficient tonicity. Local depletion, therefore, is useful in removing stagnant blood.

This scarification or application of leeches may be repeated every few days until we find that it has a decidedly beneficial effect. At the same time, or alternating with this treatment, we may stimulate the uterus to contract and improve the nature of its muscular fibre by inserting within the cervical canal a small pledget of cotton soaked in glycerin, or even a small tupelo tent. Its presence awakens expulsive efforts, as proven by subsequently finding the one or the other thrown out, and we may soon find that the body of the uterus is becoming smaller. With this method we combine the use of ergot in small and frequently-repeated doses, withholding it on the appearance of constant pain. While there yet remains muscular tissue susceptible of stimulation we may expect efficient aid from this drug, but if the muscular fibre has been largely displaced by connective tissue, we need not anticipate any benefit. A uterus in this condition will retain its abnormal size in spite of all efforts to reduce it.

Furthermore, we may blister the cervix with vesicating collodion, painting it over the cervix and allowing it to dry by exposure to the air. The discharge of serum thus produced will deplete the organ and also change the character of the everted mucous membrane of the cervix, which, if not eroded, will, at any rate, probably be the seat of enlarged glands with cicatricial induration.

Churchill's tincture of iodine swabbed over the surface and supplemented by glycerin dressings will be found of great assistance in furthering this object. This treatment may be repeated every second or third day, according to the tolerance of the patient and the effect produced, but the blistering need only be at longer intervals, say of two or three weeks.

We must not forget that the increased size of the uterus may be dependent on the common association of thickened mucous membrane with fungous growths in the parenchyma. Such a condition clearly

indicates the removal of everything of this nature by scraping or pinching with the spoon-curette. This process will be fully detailed in speaking of the general treatment, and need not be enlarged upon at this point. Some benefit may be obtained also by the local use of the galvanic current applied in moderate strength.

As a final and more positive cure of this condition we come to the operation of trachelorrhaphy itself, which, apparently by its healthy stimulation, establishes a change of nutrition by which the arrested involution is carried on to completion.

TREATMENT OF LACERATION.—The treatment of laceration of the cervix uteri may be divided into that which is palliative and that which is curative. The former includes those means, already considered in the section on Subinvolution, which serve to allay the troublesome symptoms, even when we employ them as preparatory to an operation. The latter includes the methods used for effecting a radical and permanent cure.

Palliative treatment may be undertaken from the very first moment of recognition of the lesion. If it be established, even during childbed, that laceration has taken place, it is essential at once to begin giving hot vaginal douches of an antiseptic character.[1] The douche should be administered to the patient in the position in which she lies, and that can be very readily accomplished by placing a bedpan beneath the hips and making use of a Davidson syringe beneath the bed-clothes. However it be accomplished, the douche should be copious and fairly hot— say, one gallon at a temperature of 105° to 110°; there need be no fear about checking the lochia. The antiseptic should be either a solution of bichloride of mercury, 1 : 3000, or of carbolic acid, 1 : 40. This douche should be given to the patient certainly every twelve hours, but it is far preferable to administer it every six hours.

There are several indications to be met by the use of this hot water with the disinfectant. We have seen in our previous consideration of this condition how frequently the cervix is bruised, contused, and lacerated after labor. The parts have been immensely congested, and, being so crowded in the pelvis, they inevitably retain this character for some considerable time. Then there are some parts which are absolutely destroyed; they break down and become a source of possible blood-poisoning. Then, again, the parts with full vessels— and, if lacerated, with open-mouthed vessels—are ready to take up what there may be of septic material, whether this be from the broken-down cervical tissue or from an unwholesome change in the lochia. The lymphatics also are ready to absorb any morbid material

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[1] "On the Prevention and Treatment of Puerperal Septicæmia," by Dr. Thomas More Madden of Dublin—synopsis of paper sent to the Ninth International Medical Congress, reported in *New York Med. Journal*, Oct. 22, 1887.

present. Moreover, the plexuses of veins in the pelvis outside the uterus, the lymphatic glands, and the cellular tissue have all passed through a condition which leaves them most ready to yield to inflammatory action. Prophylactic measures are therefore most strongly indicated.

The hot water will serve to empty the smaller vessels, as it stimulates their muscular coat to contract, and they, in turn, act on larger vessels, which gradually become depleted, the combined effect being that we succeed in giving to the muscular tissue of the cervix some degree of contractility: it gathers upon itself, the uterus is raised in the pelvis, the torn parts are somewhat hugged together, breaches are closed; and the longer and more effectually this can be maintained the more we may hope that union by first intention will take place.

The antiseptic is an essential adjuvant, for it will not do to allow any material to lie in the neighborhood of the wound which is not absolutely sterilized. The hot water will not do this alone, and we must make sure that the result is accomplished.[1]

Even wounds of those parts which receive no treatment whatever heal often in the most remarkable manner, as shown by the numerous cicatrices found in women who have not complained at all: therefore is it all the more encouraging to hope for good results when we bring our methods of cleanliness and astringency to bear.

When a case has passed beyond this first stage, and we see it no longer in its freshness, but with the parts already returning to something approaching their normal state, we have still other conditions to treat. The eversion now becomes apparent, and with it, more and more as the case proceeds, we have the erosion.

The hot water which we have already made use of will continue to be beneficial, and so also will the disinfectant, notably the carbolic-acid solution, as an astringent. We cannot confine ourselves to these means, however. We must continually seek to maintain the uterus at its proper level in the pelvis, and, though this is accomplished to quite a considerable degree by the hot-water douches if properly given, yet we must further the object by placing nicely-fitting pads of cotton-wool underneath the cervix, so as to lift it from the floor of the pelvis. This cotton-wool, being soaked in glycerin and placed directly against the crown of the cervix, is a very soothing application and serves our purpose well, as the glycerin has a marked affinity for water, and so acts as a constant depleting agent on the capillaries of the cervix.

Special attention is also required by the erosion, which, if recent,

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[1] "On Lying-in Institutions, especially those in New York," by Henry I. Garrigues, M. D., in *Trans. Am. Gyn. Soc.*, 1877, p. 592; "Antiseptic Midwifery," by Dr. H. I. Garrigues, 1886; "Antiseptics in Obstetric Practice," by Dr. W. L. Richardson, in *Boston Med. and Surg. Journ.*, Jan. 27, 1887.

will probably be cured by a thorough performance of the above ope-
ration, this beneficent result being secured by the depletion of the pelvic
circulation and of the vessel-loops seen in this condition. We shall
meet erosions in various stages, and we must be prepared to adapt our
treatment to the individual case. In most instances the simple astrin-
gents will serve every purpose; for instance, I have repeatedly reduced
a very angry-looking and extensive erosion from the violent red color
down to almost the normal pink of the rest of the mucous membrane,
while holding it in view with the speculum, the patient lying on the
side, by simply throwing warm soapsuds against it with the gyne-
cological syringe. It is a most interesting process of treatment to
watch, and it is most convincing of the superficial character of this
lesion, as well as being calculated to establish the fact that in most
cases there is absolutely no destruction of tissue.

Such treatment, carried out for five or ten minutes, will prove most
serviceable, but of course it is only temporary. When the patient
stands on her feet again and the uterus settles down, the pelvic vessels
are drawn upon and their calibre diminishes. The return of the
blood is impeded, and the fulness will show in the capillaries of the
erosion as it did before; so it is by constantly repeating the process
and carrying out the other indications that we finally attain to good
results.

Among many good agents for application to such surfaces we may
mention the following: tannic acid in glycerin, ʒj–ʒj; pyroligneous
acid, full strength; the impure carbolic acid or coal-tar of Squibb;
Kennedy's extract of pinus canadensis; muriated tincture of iron;
Monsel's salt; and iodoform.

At the same time that we treat the erosion we must seek to over-
come the eversion. This we accomplish partly by raising the uterus
and partly by packing cotton around the edges of the cervix, being
careful not to make too much pressure on the vaginal walls, lest we
check the venous return and thus defeat our object.

Bilateral laceration is sometimes accompanied by enormous eversion,
and we may be tempted to replace the parts and retain them in normal
position until operation, by means of a silver stitch passed through both
lips, with the ends twisted in the median line. This procedure virtu-
ally closes the cervix temporarily. When the lips are very thick,
excessive traction on the suture may cause it to cut out, and we may
repeat the operation, but we generally find ourselves obliged to desist,
because the lips simply become more and more injured. I have re-
peatedly used this method, hoping that the compression of one lip
on the other would diminish the thickening by promoting absorption;
and although I have thought that an obstinate erosion was improved
by rolling the lips over and by the direct pressure, the operation has

counterbalancing drawbacks. The closure of the cervix prevents the treatment of diseased glands in its walls and the emptying of deeply-lying cysts, so that when we come to operate radically we find much more to be done in the way of preparation than we had been led to imagine from external appearances. These glands and cysts claim a goodly share of our attention.

Ordinarily we do not see these injuries until the congestion of the pelvis has become well established and the cervical glands have begun to pour forth their contents. This pathological secretion has then become a habit of itself demanding treatment. Our first duty is to remove the discharge, which is often so tenacious that it will cling in the mouths of the open glands in spite of our efforts. The best mode of effecting the purpose is to insert into the canal a small piece of dry sponge grasped by the forceps, and to rotate it so as to engage the tough mucus in the interstices of the sponge. Sometimes we may succeed in drawing the discharge into a very tight gynecological syringe provided with an open mouth.

Making an application of carbolic acid will so coagulate the albuminous mass that we can even grasp it with a pair of forceps, but this application changes the underlying tissue as well, and interferes with our proper appreciation of the condition. For subsequent treatment, however, this plan answers remarkably well. Should the discharge be thin, it need only be removed with a scrap of absorbent cotton held in the forceps.

When this is accomplished and we have an opportunity to inspect the diseased surface, our object will be to apply whichever substance will the most readily aid in reducing the amount of discharge and promote healing of the hypertrophied glands. Churchill's tincture of iodine or carbolic acid has been found to be the best. Each is powerfully antiseptic; the iodine is alterative as well, and the carbolic acid is escharotic. One might suppose that so strong a solution of iodine (iodinii, grs. 75; potass. iodidi, grs. 90; spts. vini rectificat., ℥j) would be too irritating to so diseased a surface; but the very nature of the disease calls for a stimulating application, the glands, though active in yielding a secretion, being yet sluggish in fact, and therefore well disposed to bear an irritating substance. Even this will oftentimes not suffice, and we find it necessary to change the character of the tissue completely, or even to destroy the more superficial glands by scraping the surface with a curette, dull or sharp depending on the severity of the case.

This latter procedure, if properly carried out, will scarcely be called for more than once in any given case, but the iodine or carbolic acid will have to be applied every second or third day for a long while. It is useless to make such applications more frequently, for the tanning of

the surface which we effect will not pass away within forty-eight hours, and it may be longer.

.It is possible that these two methods will fail to bring about the desired change, in which case we shall be obliged to resort to the use of chromic acid or fuming nitric acid, or to count upon overcoming the difficulty by excision of the diseased glands when we come to operate.[1]

With these diseased glands we have also the cystic formation about the crown of the cervix and along the edges of the laceration. To rid the tissues of these it is necessary to puncture every one with the Buttle spear or bistoury. The lance-shaped spear answers rather the better, since the blade widens out on both edges from the tip, and thus cuts the cyst-capsule in both directions from the point at which it enters. These cysts should be opened daily or on alternate days wherever found, and their cavity touched with some irritating substance which will promote their healing. Churchill's iodine should be applied over the whole surface with a piece of cotton, after which the cervix is to be dressed with a cotton pledget soaked in glycerin, which will provoke a watery discharge by exosmosis, as was stated in the section on erosion. Such treatment pursued for weeks will restore the surfaces to normal condition. There may still be a lurking pelvic inflammation and an induration of the angles, causing enlargement of the part, which must be watched to prevent return of all the symptoms.

It will be noticed that no mention has been made of the nitrate of silver as an application to these diseased surfaces, and purposely so. I would still ignore it unless to warn against its use.[2] Those who from remote times have sought its aid have perhaps felt there was reason to congratulate themselves on the effect obtained by its use; and, to all appearances, its effect is beneficial—speedy covering over of these eroded surfaces and rapid healing—but the result is no more lasting than it is from the treatment indicated above, and it has the disadvantage of a surface which is pathological in reality, though pleasing to the eye. The mucous membrane is really indurated, and nerve-filaments of the sympathetic, being imprisoned in such tissue, will speedily lead to injurious reflex effects.

We must not allow ourselves to be deceived by apparently normal surfaces secured by the use of nitrate of silver, or otherwise. Unless the cause of disease is removed we shall witness a succession of complete relapses, which will prove our treatment to be valueless until

[1] "On the Relation of Lateral Cervical Lacerations to Catarrh of the Cervix uteri, and the Necessity for Emmet's Operation," by Prof. C. Schroeder, in *Am. Journ. Obstet.*, New York, 1882, xv. 538–545.

[2] See, as opposed to this opinion, "Notes on the Treatment of Recent Lacerations of the Cervix uteri," by Ellwood Wilson, M. D., *Trans. Am. Gyn. Soc.*, 1886, p. 94, and discussion.

it is completed and rendered permanent by an operation for closure of the laceration.[1] An opportunity to compare a case treated palliatively with one treated by operation will remove all doubt as to the advisability of the course recommended.

Nor does it seem to me that repair can ultimately take place as well in a case which is far removed from the normal. Having always put patients through this course, I have not had the opportunity to witness the results after the other method, but still cling to the belief that it is not as rational a mode nor as beneficial, unless, indeed, all the diseased tissue be removed, in which case we are still further and uselessly diminishing an already atrophied cervix.

The preparatory treatment of necessity includes also that which is directed against the inflammatory complications, past or present—cellulitis, peritonitis, lymphango-adenitis, etc. It would manifestly lead us too far to consider the treatment of these conditions at length, however, and, just as in the section on Complications I referred the reader to their consideration elsewhere in this work, so at this point will it suffice to refer again to such matter. The treatment of involution I have considered by itself, and somewhat at length, since it is an almost inseparable part of lacerations, whilst the other complications are mostly accidental.

So far for the local care, but how manifestly inadequate would all this prove to be were we to content ourselves with our effort in this direction and neglect the accompanying anæmia, the nervous exaltation, the depressed spirits, the loathing of food, the faulty digestion, the habitual constipation, and the sleepless nights! How blind would the physician be, and how unskilled in the management of such a case, were he to lose sight of his part as a general practitioner and magnify his importance as a specialist! Iron, beef and fats, repose, diversion and change, fresh air, digestives and wines, laxatives, massage, and baths, are so many means to bring to bear on these poor invalids to aid in restoring their general health. If these, and the surgical means also, are not properly carried out, the patient's constitution will almost surely break down. What was true when Dr. J. Henry Bennet wrote more than twenty years ago is as true to-day—viz.: "The anæmia and debility which uterine diseases constantly produce are, through their reaction on the digestive and nutritive functions, powerful predisposing causes to pulmonary consumption, especially when there pre-exists any constitutional tendency;" and further: "Lesions which lower vitality, such as uterine lesions, both lead to its development and prevent its arrest and cure when once it has established itself."

We have now established the necessity for preliminary treatment

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[1] "Notes of Two Hundred and Thirty-one Cases of Operation for Laceration of the Cervix uteri," by T. A. Reamy, M. D., in *Med. News,* Philada., 1884, xliv. 531–533.

and given it thorough consideration, and it becomes proper to discuss the indications and time for the operation.[1]

There are, of course, many cases requiring no treatment, but these we may generally classify as fissures. We must bear in mind, however, that some apparent fissures may have been extensive lacerations, partly healed and possibly with cicatricial tissue ; others may be large internal rents presenting merely a fissure at the surface. In other cases the indurated and sensitive angle of laceration will be very marked and easily detected from the first, and in these there can be no question as to the necessity of removal of such a foreign body as a cicatrix. In another class, do what we will in the way of treating the enlarged and weighty uterus, we cannot reduce its size unless we resort to this operation. Why this result should follow we cannot explain, even on the hypothesis of a revulsive effect. We may, nevertheless, count upon it as confidently as after an operation for complete removal of the cervix. Another object to be attained by the procedure is the prevention of repeated abortions by restoration of the inner circle, the sustaining part.

We shall frequently find that during the preparatory treatment we have maintained the cervix so clear of mucus that a woman becomes impregnated in spite of our wish that she should not until she is well, her previous history showing that she will surely abort. What are we to do in such a case? Our remedy still lies in operating, and we are enabled to do so without disturbing the pregnancy.[2] All that is necessary is that we do not put it off until the uterine circulation has become so active that we are in danger of having much hemorrhage or of exciting uterine contractions. In the first three months it may be done with safety.

Finally, the operation is resorted to for the purpose of *keeping* the woman well when she has been cured of the accompanying eversion, erosion, and cervical catarrh.

If the operation seems advisable, I know of no contraindication except a pelvic inflammation.

Operation.—It is necessary to have the bowels thoroughly emptied by a couple of compound cathartic pills given the evening before, or, if the bowels have been in good condition, by an enema of soapsuds. Also, because of the anæsthetic, it is essential to have the stomach empty at the time of operation. One hour or one half-hour before the time set for the operation it is well to have an attendant give the patient a fairly copious and very hot antiseptic vaginal douche. This

[1] "The Proper Limitation of Emmet's Operation for Laceration of the Cervix uteri," by C. C. Lee, M. D., in *Med. Rec.*, New York, 1881, xx. 78-80. See also discussion of the paper by Drs. T. A. Emmet, Pallen, Polk, Mundé, Putnam-Jacobi, and Wylie.

[2] "Surgical Operations on the Pelvic Organs of Pregnant Women," by Matthew D. Mann, A. M., M. D., *Trans. Am. Gyn. Soc.*, 1882, pp. 363-367.

will deplete the hemorrhoidal system and prevent free bleeding during the operation; besides, it will remove from the parts any possible source of infection which might endanger success.

We need not consider here any of the various methods of operating except for the purpose of cautioning against the dorsal position. With the patient on her back the uterus, if sufficiently mobile, may be drawn down until the cervix reaches the vulva, but we secure no advantages not possessed by the Sims position. On the contrary, there are many disadvantages which may interfere with a successful operation, such as the liability to irritate a latent peritoneal thickening, the strain upon the uterine ligaments which we have recently tried to strengthen and shorten in order to cure a retroversion, and, finally, the danger of effecting a change in the relations of the cervix and vagina.

If there has been a procidentia of long standing, itself remotely caused by a laceration, and it is desirable to restore the cervix as a link in the chain of measures necessary to overcome this displacement, it is entirely justifiable to do so; but even here the rational physician will have restored the uterus to its place in the pelvis long before he thinks of operating, and in such case he would have no thought of again bringing the cervix to the outer world.

So we shall assume that the cervix is to be operated upon *in situ*, the position chosen that of Sims, the patient lying on her left side, or on the right, the undermost arm placed against the back, and the knees drawn up as much as possible. This position, commonly called the semi-prone lateral, gives us the best opportunity to expose the cervix to view and allows the uterus to be the most free in the pelvis. It, however, sometimes cramps the patient, especially if she is fleshy or subject to any difficulty of respiration, and all the more when she is to take an anæsthetic; but by placing the uppermost hand flat on the operating-table, near the chest, and so lifting the elbow, the shoulder of that side will be well raised and the chest will be comparatively free from compression.

Anæsthetics, as a rule, are used, and yet unnecessary, as the operation is not painful. Nevertheless, it may be advisable to put the patient to sleep to save her from the exhaustion of a long operation and to secure full control over her. In the earlier part of the operation, and until the perineum yields to the necessary pull upon it, the pain thereby excited may cause the woman to interfere with our procedures by contracting the perineal muscles. Therefore it is well to employ an anæsthetic, unless there is a strong contraindication,[1] such as advanced

Dr. T. A. Emmet in 1866 called attention to the dangers attending the administration of ether in patients suffering from Bright's disease. See also article on same subject in *Med. Record*, New York, March 10, 1883, by Dr. R. Van Santvoord: he also mentions many cases from other authors, showing the ill effect, others showing that it has proven harmless. See also Millard, H. B., M. D., *Bright's Disease*, 1886, p. 247.

kidney disease, or marked organic heart trouble, or catarrhal bronchitis. We must carefully watch for any harmful effects from the combination of morphia with the anæsthetic. Everything may go well until the introduction of the speculum, when, from excessive pain excited directly by cicatricial tissue about the perineum or by reflex from the same cause, the patient may become unmanageable and require morphia. Accidents from dangerous narcosis are then prone to occur, and must be prevented by careful watching. A similar rule should prevail in case we have attempted the operation with morphia alone, and subsequently find it necessary to employ an anæsthetic.

Cocaine in 10 per cent. solution has also been used as an anæsthetic by direct and constant application to the cut surfaces. On account of the comparative insensibility of the parts to be cut we may be mistaken in attributing good results to this agent, and we could only expect information on this point from the details of its employment alone in a case which had been painful at the outset. It has also been successfully used by injecting into the substance of the cervix with the hypodermic syringe.

The anæsthetic should be administered to the patient lying on her back, as respiration is easier in this position. It is essential to use as little of the drug as possible, and the quantity necessary will depend more on the judgment of the anæsthetizer than upon any apparatus he may employ.

The operation[1] is begun by placing the perineal retractor in position and bringing the cervix into view by the depressor. The lower edge of the lip to be denuded is seized by a tenaculum which catches up the mucous membrane at the point at which it is to be removed, and the scissors engage the tissue back of the tenaculum and remove a strip as far up into the canal as is deemed necessary for the proper apposition of the parts. When the anterior and posterior lips of the lower portions have been pared, we proceed similarly with the upper portion if the rent is bilateral. It is essential to remove as much mucous membrane as will bring the two sides of the cervix together, leaving only sufficient undenuded in the median line of both lips to form a canal of natural size and uniform calibre.[2] This undenuded strip should be wider at the crown than higher up, because of the difference in the degree of involution which will take place. Should the lips be very thick and the rolling out very marked, it will be well to

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[1] I will not occupy the space nor take the time of the reader to describe the various instruments in use for this operation. Speculum, depressor, tenacula, scissors, needles, twisters, forceps, shield, and feeder will be all found pictured in Vol. I. of this work in the article "General Consideration of Gynecological Surgery," p. 328, by Dr. E. C. Dudley.

[2] "Another Modification of Emmet's Cervix Operation," by R. Stansbury Sutton, A. M., M. D., LL.D., *Trans. Am. Gyn. Soc.*, 1886.

remove sufficient of the tissue to make the adjustment of parts more perfect.

When the mucous membrane is all removed, we excise any cicatricial tissue found in the angles of the lacerations. At the first touch of the scissors it often appears that we have to deal with an uncommonly soft tissue; indeed, the mucous membrane on the vaginal side is thicker at this point than elsewhere, since the underlying structure, being more dense than normal, interferes with the circulation, and in that way makes the parts infiltrated and puffy; so that this condition may often be taken as an indication of what we shall find underneath. It is necessary now to cut somewhat boldly and deeply up to the limit of the laceration, having first seized the angle with a firm tenaculum from within the canal, and having drawn it well up to the level of the denuded portion.

I consider it far better practice to cut inward toward the uterine canal when removing this cicatricial tissue than to cut through the cervix and vagina, as is sometimes done, as the latter mode is unnecessary, involving as it does the outlying cellular tissue. There is danger of opening into a vessel of considerable size, which will prove difficult to ligate; and in case of faulty union as the outcome of the operation, there will be an ugly gaping wound into dangerous parts or a granulating wound with ultimate cicatrization far more extensive than anything resulting from the confinement.

When all the hardened tissue resembling cicatrix is removed from one or both sides, we may proceed to close the wound.

Though we may not, up to this moment, have made use of any special antiseptic means, though, of course, everything we handle should have been aseptic, yet I would advise operators to meet the views of others practising in this line by thoroughly washing the denuded surfaces at this stage with a 1 : 3000 solution of bichloride of mercury. This can be done by means of a stream turned against the cervix or by the aid of a sponge probang thoroughly soaked in the solution.

The next step will be the introduction of the sutures: silver wire is the material used, and I am quite confident, all things considered, that it forms the best suture for this purpose that we have. Should we propose to close the perineum at the same sitting, catgut sutures may be used, for the reason that we thus avoid having to make any traction on the new perineum for the purpose of removing them, as they will dissolve; still, even then wire may be used, for if properly applied it may remain in position indefinitely, and be removed at any time after the perineum is thoroughly strong.

The disadvantages of catgut are, first, the difficulty of tying knots up in the vagina; second, the liability of an important stitch to give way by the knot loosening; third, the possibility of the catgut dissolving

before union is complete; and lastly that it may not be free from bacteria.

The advantages of the wire are—that it is easy of application, is perfectly secure for all time, and acts as a support to the newly-approximated surfaces, as each suture is made to lie against the cervix, and so, in a measure, to clasp it; furthermore, it is absolutely clean and unirritating.

Silk and silkworm gut have also been used, but offer no advantages over the above.

In considering the mode of passing the first suture in such cases we must keep in mind the extent of our denuded surfaces, and realize that, if we have had to remove much at the angle within the canal, our inner denuded portion will be at a much higher level than the outer or vaginal denudation. Now, as it is essential that we control any possible bleeding by our first stitch, we must make sure that it reaches fully to the limit of the angle, and for that purpose we are obliged to pass it in a slanting direction from the vaginal side well up into the cellular tissue before penetrating the cervix. To make doubly sure that it circumvents the angle, we drag the latter again to the surface, just as we did when denuding it. This is not at all an easy part of the operation, for in seeking to force the point of the needle toward us to catch it, in order to draw it along, it is apt to break, and not only one but successive needles when we attempt to repeat the manœuvre.

To give ourselves more room, and thus to facilitate the insertion of this first stitch, a better method is to pass it from within outward; it is easier to guide the point of the needle to a given level on the vaginal side than to a fixed point within the canal. This latter method requires two needles for one stitch, dragging in each end of the silver wire after they are both passed, thus making it continuous. The second stitch is to be of the same kind where it has been necessary to cut deeply; the third and subsequent ones, however, may be passed in the manner first spoken of— namely, from without in, inserting the needle at one-eighth of an inch from the edge, and bringing it out on the canal side directly at the edge of the undenuded portion, each thread in turn dragging a silver wire with it.

FIG. 201.
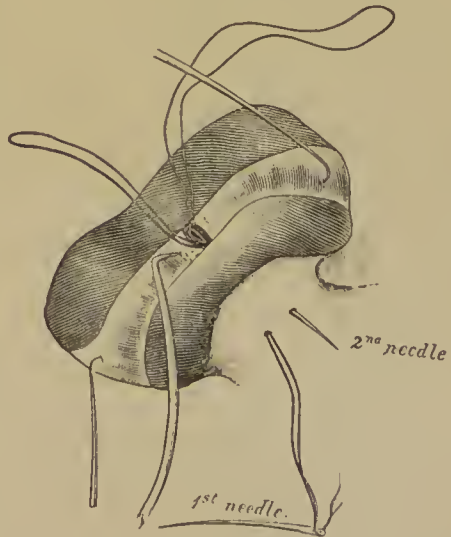
The deeper the inner incision has been, the more the sutures will radiate from without in, being rather close together on the vaginal side, but spreading out toward the canal.

FIG. 202.
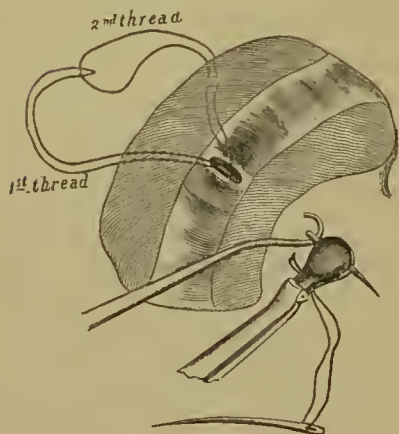
FIG. 203.

It is well to begin passing the stitches on the lower side, just as we began the paring, so as not to be bothered with blood flowing over our work, which would surely be the case had we denuded the upper side first. There is oftentimes considerable bleeding from passing the needles also, especially if they be spear-pointed or triangular.

Another point worth noting is that the deep sutures of the two sides should be passed before completing either one, otherwise we shall find it impossible to open out the lips sufficiently to reach our deep angle.

The stitches should not be more numerous than will just suffice to hold the parts together nicely without gaping intervals. If too many are introduced, they cut off the blood-supply of intervening spaces and we are apt to create suppurating points.

It is not amiss to go over the raw surfaces again with the antiseptic solution, though it cannot now reach all the parts as thoroughly as before.

We then begin to twist the sutures, and begin with the uppermost on either side, so as to bring the two inner edges of the wound in perfect apposition at the deep angle. It is desirable not to make excessive traction on this first stitch, because it includes a considerable amount of cellular tissue in the broad ligament, and is sure to cut through it, and possibly through some vein in the same region. Do so as lightly as we may, we still commonly find at the time of its removal that it has become considerably imbedded, and very often is lost in a great gash.

This leads me to mention one other detail, which is that we should leave the first one or two stitches excessively long—say an inch and a half—so that we may be sure of finding the ends when we wish to remove them.

Each suture as it is drawn upon sufficiently to bend the wire on the inner side, thus making sure that the two denuded surfaces are touching, should be again bent over at the outer level of the wound, so that when it is twisted the parts will not be drawn up any tighter than we wish to have them. This makes all the stitches uniform ; and with this device it matters little how irregularly the stitches may be passed from the outside. This result is doubly secured if we make proper use of the shield and bend the wires over its edge, twisting with our forceps until the two cross just over the wound. If now, while holding the wire securely with our forceps, we place a tenaculum against the base of the twist and make counter-pressure, bending the wire over the tenaculum until it lies flat on the cervix, we shall secure a perfectly snug position for the suture and obtain the splint effect spoken of above.

Once more we make counter-pressure at the point at which we wish to cut off the wire, about half an inch from the line of union, and snip it with our wire-scissors just within the bend so made.

Each suture, in turn treated in this manner, will secure for us a very satisfactory result. Care must be taken to twist the wires only moderately tight, as œdematous swelling is sure to take place, and they will be deeply buried, producing a certain amount of sloughy discharge in the bed of each one.

This completes the description of the operative procedure for a simple unilateral or bilateral laceration. But as there are many varieties of laceration, so, of necessity, are there many variations in the mode of operating which every one will, more or less, have to adapt to his own uses according to experience.

In a case of stellate laceration, instead of obliterating each fissure separately, we should group them in a unilateral or bilateral operation by excising the smaller nodules in wedge shape and bring the fresh edges together. We are here guided by the principles which lead to operation in any case.

A double laceration with one angle free from cicatricial tissue and without eversion is best treated by leaving the free angle as an improvised os and closing only the opposite side. This rule is not to be blindly followed, however, since the condition of the cervical glands may forbid such a course; yet we must remember that it is better for the patient if one operation can be made sufficient. When the cervix has been very much thickened with glandular hypertrophy it is generally undesirable to close both sides at once. However much of this tissue may be cut away, if an undenuded canal surface is left, that portion will be much

thicker than the rest, and will form the apices of two cones, as shown in the accompanying illustration.

Fig. 204.
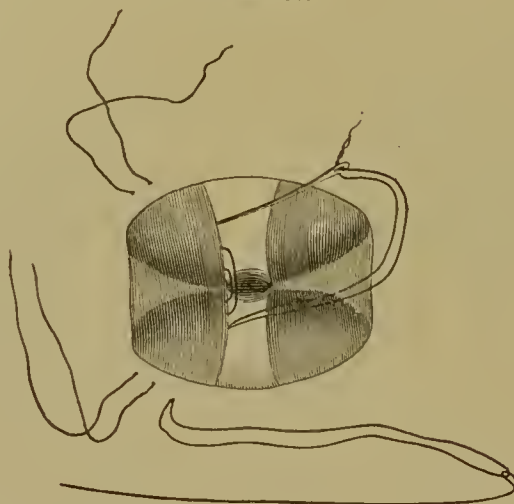
If both sides are united, the result will be that one or both sets of stitches will cut out. Under such circumstances, if the case must be

Fig. 205.

operated upon it is better to unite one side, and later, when involution has proceeded somewhat, to undertake the other.[1]

[1] See Sutton: *loc. cit.*

Fig. 206.

Fig. 207.
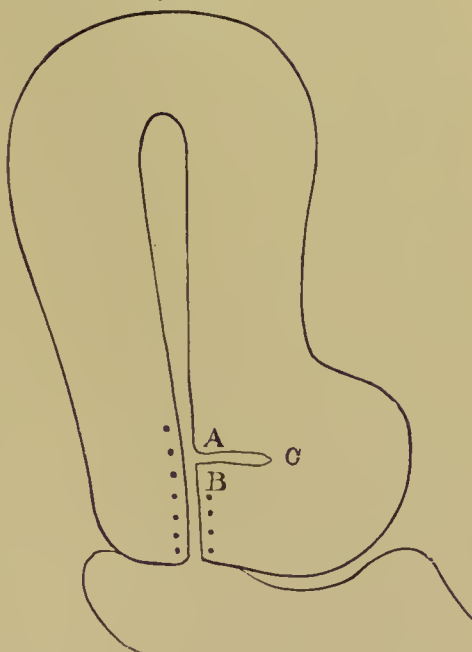
If one lip is longer than the other, it will remain so if brought together in the ordinary way. It is essential to have the sides equal in length, and we accomplish this by shaping a false angle, as shown in Fig. 208. The longer lip will be brought to an exact fit by sutures begun at the apex of the false angle. I have operated on a case exhibiting such disparity as to require the longer lip to be doubled on itself (Fig. 207). A few months later the cervix had acquired a much more shapely contour than would seem possible from this diagram, and the two surfaces formed by doubling had completely adhered, so that the canal along A and B was perfectly continuous and without a sinus toward C.

Fig. 208.
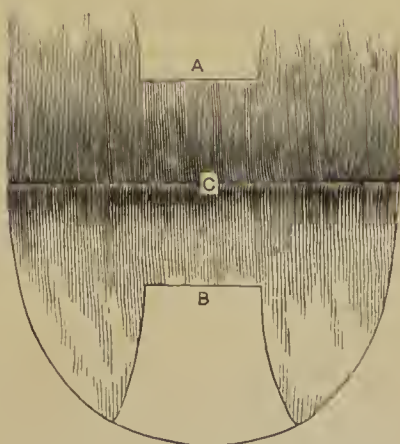
Anterior Lip seen in full: blank space represents the mucous membrane left for the canal. A and B are to come together when the lip is doubled on itself at C.

In such cases we are at first inclined to remove the anterior lip, but further consideration will show that this is only an apparent hypertrophy, and that its ablation would include the vaginal attachment and possibly lead

to an accidental wound of the bladder, which the sound proves always to be carried down with the vagina.

Now that the operation is completed, care must be taken to see that the uterus is in its proper position, for, apart from the tendency to retroversion which exists in many of these cases, we are most liable in a difficult operation to displace this organ backward by the unavoidable dragging upon it. Whoever has had a really troublesome case to deal with, thickened and indurated lips through which it is wellnigh impossible to pass a needle of any kind, will readily appreciate the bearing of this caution. Gradually and insensibly, guard against it as we will, the uterus has been drawn down farther and farther, and of course the suspensory ligaments have been drawn upon also, and, unless they are entirely sound and elastic, they will yield and will not raise the uterus to its position again. So we are obliged to replace it, and then to see that it remains in position. This can be done with the patient still on her side by simply forcing the cervix well up in the posterior cul-de-sac, or she may be turned upon her back, in which position one can make use of the two hands to effect the same purpose.

The patient is now to be put to bed and every means taken to prevent nausea, which tends to reproduce the retroversion should it have occurred, and also to strain excessively the deep sutures which bind the vagina up against the supravaginal portion of the cervix.

A method of stopping this vomiting, introduced some years ago at Bellevue, I think, has many times proven successful in my hands—namely, giving 30 grains of the bromide of potash before the operation, and repeating the dose as soon after the operation as the patient is able to swallow.

From this time on the woman is to be kept absolutely quiet and such treatment adopted as will the most positively keep down all inflammatory action. The hot douches are to be given twice daily, with the antiseptic added. The diet is to be simple; the bowels are to be kept open; and, with all this, any undue amount of pain which the douches fail to overcome may be allayed by anodynes given with discretion. Instead of using antiseptic douches, some operators prefer to put into the vagina, on and around the cervix, a quantity of iodoform or iodoform and boric acid. This "dry dressing," as it is called, has many advantages, and those who use it claim most excellent results.

The sutures may remain in place from one week to ten days or two weeks. Sometimes the parts heal in a few days; at other times they take considerably longer; and as the sutures do no harm, it is better to leave them undisturbed for the full fourteen days. In removing them it is well, after hooking up the end and seizing it with a wire-

forceps, to cut the loop on the side nearest the operator and to withdraw the suture toward the same side, since we thus press the uniting surfaces together, instead of tearing them open, as we are prone to do if we draw upon the stitch in the opposite direction.

Should the healing not be complete at any one part, it is desirable to leave the necessary stitch or stitches still longer; should any one stitch have cut out and allowed the wound to gape, thus giving a granulating surface, it is well to pass another suture or two, as may be required, to bring the parts together again.

It is generally supposed that primary union cannot take place after granulations have formed—that they, in fact, are the basis of secondary union or healing by cicatrization. This is not strictly the fact, however. I vividly recollect two cases in which on the tenth day, at the time intended for the removal of the stitches, they were found hanging loose, having cut out on one side, leaving the wound entirely open and covered with granulations. Rather than allow matters to stand thus, new sutures were passed precisely as at the first sitting, except that they had to be set farther back from the edge, and the result was perfect after another fortnight, with no trace whatever of any cicatrix or hardened tissue.

After removal of the stitches, the patient is again put to bed and subjected to the same antiphlogistic and antiseptic treatment. In favorable cases we may allow her to begin to sit up after another period of a week or ten days, according to her strength. The food must be gradually increased to regular meals at the time of her getting out of bed. From sitting up to walking and driving is but a step.

Accidents and Complications of the Operation.—Provided the operation has been undertaken at the right time, not immediately before a menstrual epoch, but after, and has been conducted antiseptically, we may be pretty well assured that nothing will go amiss.

Apart from the development of inflammatory complications, nothing is likely to happen except hemorrhage. Bleeding from the angle cannot well take place if we observe the precaution detailed in describing the manner of passing the first stitch. But it happens, at times, that a vessel may be severed, even after several days, by the sloughing through of a suture—not, of necessity, because it was twisted too tightly, but because the swelling of the parts has made it act just as if it were.

While mentioning this circumstance it is as well to point to the remedy. It would be a pity to destroy the entire operation in order to reach the bleeding point, so we may well follow a plan devised, I think, by Dr. T. A. Emmet for the positive arrest of the hemorrhage. Hot water or a tampon may be tried, but if the hemorrhage be arterial and flow from the uterine canal, the chances are that neither will prove successful. The sure method of controlling it is to pass a stitch through the

cervix, as high up as we can reach, and twist it about one side of the neck. If the bleeding vessel be within its loop, we thus control it; should the flow not cease, it is because we have not got the artery within our grasp. Now untwist the suture and swing the two ends, still held by the forceps, over the crown and on to the other side of the cervix; now twist again, and this time the control will be absolute. Such a stitch may remain for two days or longer. It will readily be seen that it would not do to leave both halves of the cervix clamped in this way, for the constriction would entail a slough; but one stitch cannot harm the half, as the anastomotic supply will be sufficient nourishment.

Should the denuded surface not be sufficiently wide, or should the tension on the sutures be too great, we are most apt to have only partial union; and that not in the length, as might be supposed, but in the thickness of the cervix. For instance, the mucous membrane of the cervical canal and the mucous membrane of the vaginal side may be perfectly united, and yet the substance proper of the cervix may stand apart as before, even with the edges curled up anteriorly and posteriorly. This is very commonly met with as a result of imperfect operative skill.

Another result, not much less common, is where we have the outer portion of the wound thoroughly brought together, but the inner edges still flaring: there is only union of a part of the denuded surfaces, the outcome being that we have a condition very similar to that described as circular or concealed laceration.

With the first we may have a persistence of most of the old symptoms, notably those of nervous origin, and it may be that the operation will have to be repeated. In the second case there will be a continuance of the cervical catarrh; it may be even more marked than before, since we have exposed more surface by denuding, and there will be no doubt in this case of the necessity for a second operation.

CHRONIC INVERSION OF THE UTERUS.

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DEFINITION.—Inversion of the uterus consists in the turning of the inside of the organ out, by which the endometrium becomes the investing, and the peritoneal covering the interior, coat. This form of displacement cannot, however, as maintained by the earlier and, most generally, by recent authors, be limited to the fundal and lateral modes of inversion, in which either the fundus or walls are first to enter and descend through the cavity, and either partially or completely escape through the os, but must comprehend cervical inversion, when the lower part of the uterus is first to extrude, " with rolling out of the body and afterward of the fundus."[1]

The various grades of this affection, expressive of the degree of inversion, which have been described by authors may be conveniently classed as either complete or incomplete—complete when the uterus is entirely inverted on itself, with the fundus, body, and cervix hanging from the os in the vagina;[2] and incomplete when there is simple depression[3] of the fundus, introversion of the walls, invagination of the fundus or walls, penetration of the inverted portion through the cervix, and even partial escape through the os. In those very rare instances of inversion by eversion of the cervix, any degree of the displacement

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[1] Reeve: *Gynecological Transactions*, vol. ix. p. 75.

[2] Hart and Barbour (*Manual of Gynecology*, p. 366, London and Edinburgh edition) state that inversion in simple, uncomplicated cases "extends as far as the os internum, but no farther. The uterus lies partly in the vagina, partly in the cervical canal. Its neck is embraced by the os externum, which may lie loosely on it or constrict it firmly." Again, at p. 367, they assert that the cervix uteri "is rarely displaced in simple, uncomplicated inversion; it forms a broad ring embracing the neck of the tumor. Sometimes the inversion is complicated with prolapsus, or, more properly, the vagina also becomes inverted, and the inverted uterus caps the inverted vagina. When this occurs the cervix uteri is more or less inverted; a part remains just above the os externum as a depressed ring, which also disappears on making traction on the uterus."

[3] The slightest degree of partial inversion is present when any portion of the entire thickness of the walls of the uterus becomes convex toward its cavity or interior, without going to the extent of being invaginated or brought within the grasp of the rest of the uterus (Crosse: *Trans. Provincial Med. and Surg. Ass.*, vol. i. p. 293, 1845).

short of extrusion of the body and fundus should be classified as incomplete.

VARIETIES.—Inversion of the uterus may be puerperal, non-puerperal, acute, or chronic—puerperal when associated with abortion, miscarriage, or parturition; non-puerperal when occurring in an unimpregnated uterus. The subdivisions into acute and chronic should relate to the duration of the interval between the occurrence of the accident and the beginning of treatment, rather than to the rapidity or slowness of the process of inversion. The terms "sudden" and "gradual" would more definitely express the process of development.

The puerperal variety comprises about 87.5 per centum of all the cases; Aveling and West rate the proportion at 7 to 1. Of the 224 cases of inversion following parturition collected by Crampton,[1] 196 are noted as having occurred "at once;" that is, simultaneously with the termination of labor. Of the remaining 25 cases, in 12 the accident occurred during the first hour after labor; in 7 during the first day; in 2 during the first week; in 2 during the first month; in 1 during the fifth month; and in 1 during the thirteenth month. The direct causal relation of parturition and the puerperal period to the displacement is thus very clearly demonstrated.

The distinction between the acute and chronic cases should be established upon some pathological basis, rather than with reference to the time of occurrence or duration of the process of inversion; otherwise the number of cases of chronic inversion would be, comparatively, very small, and be almost exclusively limited to the cases occurring in the non-puerperal womb. Winckel states that about two-thirds of all the cases of puerperal inversion are chronic. Of the 196 cases noted as occurring "at once," Crampton classifies 100 as acute and 96 as chronic. This distribution is determined by the interval between the time of occurrence of the accident and the beginning of the treatment, which for the acute is limited to thirty days, thus corresponding with the ordinary duration of the puerperal period, during which time the retrogressive changes in the uterus are going on and are probably completed before its expiration. So far, then, as regards puerperal inversion, the terms "acute" and "chronic" possess special significance, inasmuch as they distinctly differentiate the cases subjected to treatment during the process of involution from those in which it is delayed until those changes in the inverted organ have been at least partially completed. A classification based upon this distinction separates the cases by well-known pathological conditions referable to uterine involution, and bears a very important relation to the duration of the suffering of the patient and to the method of treatment. Among

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[1] *Amer. Journ. Obstet.*, vol. xviii. p. 1148. All of these cases occurred or were treated after the publication of Crosse, and are therefore more valuable.

the chronic must also be classed those inversions caused by (Winckel) tumors, especially myomata, either polypoid or sessile. Hart and Barbour say inversion is "peculiarly frequent in sarcoma," but only in a single instance has it been found associated with carcinoma uteri. Crosse reports the case of Thatcher, in which inversion was produced by the "expulsion of hydatidous masses formed within its cavity."

FREQUENCY.—It is fortunately a very rare accident. Authors differ in regard to the ratio of frequency. Madden rates it at one in 190,000 cases of labor; Reeve, at 1 in 140,000; and Aveling, at 1 in 100,000. In the Vienna Lying-in Hospital from 1849 to 1882, in a total of 280,000 labors, but 1 case occurred. Puerperal inversion is the most frequent. Next in order of frequency are those cases produced by uterine tumors, about 10 per cent. All other causes combined do not yield more than 2.5 per centum of the total number of cases.

PATHOLOGICAL ANATOMY.—The changes which take place in the inverted womb depend upon its duration, the degree of inversion and constriction, and the cause. The tendency to hemorrhage increases with the amount of constriction. Œdema and swelling are present to a greater or less extent. The mucous membrane is usually reddened, and may be ecchymotic in spots. Sometimes it is dry and rugged. Gangrene may result. Spontaneous amputation has occurred, and the entire inverted portion has sloughed off. Erosions, vegetations, and ulcerations are quite commonly present in cases of long standing. Sometimes adhesions take place between the inverted organ and vaginal walls, and between the adjacent surfaces of the inverted peritoneum, though usually such adhesions are not very firm or extensive. The tubes (Fig. 209), round ligaments, and broad ligaments, together with the ovaries, and sometimes loops of intestine, may be drawn into the pocket of the inversion. All the intra-abdominal appendages appear to spring from the peritoneal pocket, and those parts which are not drawn into it are usually swollen and congested. The size[1] of the excavation depends on that of the uterus before inversion. It is much larger when occurring after labor than when it is the consequence of pathological growths or has occurred in a chronic manner. In the latter forms only a part of the oviducts are drawn into the inverted cavity, but not the ovaries or fimbriæ. When succeeding labor and persisting for some time, the process of involution is not arrested. As it progresses the excavation diminishes and the ovaries and oviducts may resume their normal position. Usually, the inverted organ remains within the vagina, but occasionally it protrudes externally and hangs between the thighs. In puerperal inversion the process of involution is much slower than after normal parturition, consequently the size of the inverted uterus will vary greatly according to the duration of the

[1] Klob: *Pathological Anatomy of the Female Sexual Organs.*

interval from the time of the accident. Sometimes months elapse before it resumes its normal size.

The pear-shaped tumor of inversion presents its larger part below, and its small extremity at the level of the vaginal connection. The proximal end is roundish and without an orifice. When the inverted

Fig. 209.
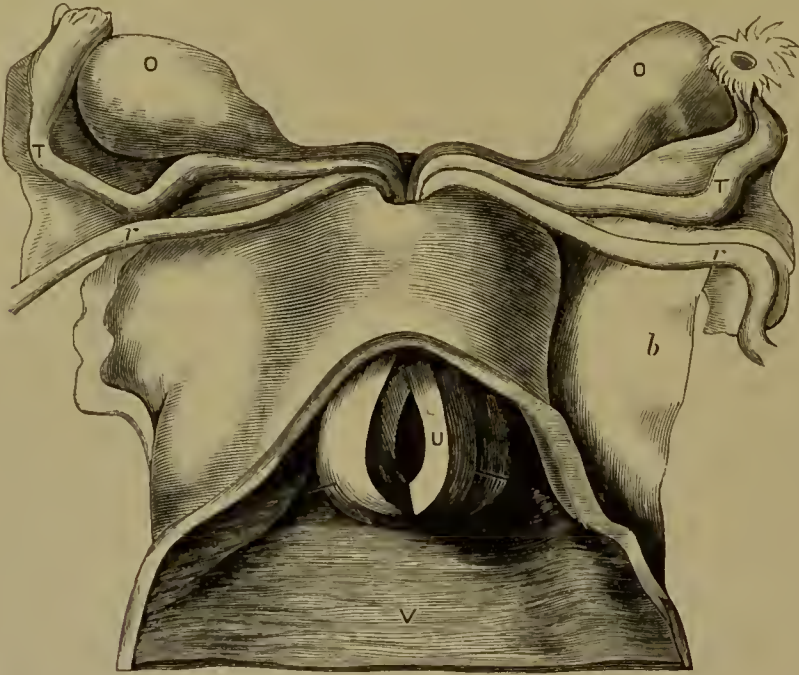
Inversion of Uterus (Crosse): The inverted uterus (U) lying in the vagina (V) is cut open to show the peritoneal sac, which does not contain the ovaries (O); bristles are passed into uterine orifices of tubes. The opening from the abdomen into the peritoneal pouch is indicated by the convergence and descent in it of the Fallopian tubes and round ligaments. The ovaries are nearer to each other than in the normal state, and are seen above the tubes. The view is anterior, and the cervix is concealed by the peritoneum and parts beneath it (after Hart and Barbour).

organ is extruded beyond the surface the epithelium of the mucous surface is transformed into pavement epithelium similar to that of the vagina.

MODES OF INVERSION.—The modes of inversion may, for convenience, be described as fundal, lateral, cervical, and spontaneous. The fundal implies primary depression or dimpling at the top of the uterus. This may begin in the middle or at either horn, followed by the other horn and then by the body. The lateral begins with introversion of a part of either the anterior or posterior wall, usually at the placental site. In either mode the primary depression is the result of localized paralysis, traction upon the internal surface, or violence from without. The inverted portion is seized by the surrounding contracting segment of the uterus and forced downward into the cavity and through the

os tincæ. If the expulsive efforts excited by the indented part fail in driving it through the external os, partial inversion will result.

Fundal and lateral inversion take place by the process of invagination; the cervical by the process of eversion, beginning at the os externum. This mechanism of the displacement is not generally accepted, but the arguments and citation of cases by Puzos, Taylor, Thomas, Reeve, Tyler Smith, and others seem to establish the fact beyond dispute. Reeve describes the process as beginning with "pouting of the cervix, then its eversion, with rolling out of the body and afterward of the fundus." "Preparatory to it (Reeve) the walls of the uterus have undergone a pathological change; the organ is soft and flabby." The case reported by Taylor not only demonstrates the theory of cervical inversion, but proves that it may occur in a nulliparous womb. "The patient had always had excellent health; menstruated at thirteen; has been regular ever since; never had any discharge from vagina or uterus; never had any sexual intercourse;" and "the hymen was intact."

Spontaneous inversion[1] occurs in those cases "in which the womb, without cause, provocation, or premonition, turns itself inside out, all at once, some days, weeks, or months after delivery, on going to stool, straining, laughing, crying, singing, walking, or other kind of exertion or no exertion at all." Lee enumerates 23 such cases in his collection of 142 cases of inversion of the womb. It is not believed that the womb has the power to commence the displacement, or even to cause a depression; but when from some cause a part has been indented, such introcident portion is grasped and propelled downward by successive uterine contractions, whilst the os and cervix become dilated. Crosse and Lee believe that intra-abdominal pressure is the predominant factor in the causation of this mode of inversion. Duncan[2] describes a "spontaneous active uterine inversion" in which a portion of the fundus, most probably the placental site, is paralyzed, and, in consequence of the "state of the retentive power of the abdomen or positive bearing down," such part is forced into the uterine cavity. This inverted part is "seized by the adjacent contracting segments of the uterus, is pushed down, and expelled through the os or even beyond the vagina."

The occurrence of spontaneous inversion is not confined to the puerperal or to the parous womb. Tyler Smith[3] asserts that the "nulliparous organ has been known to invert itself as the result of spasmodic action in long-continued menorrhagia or as the result of a small polypus or fibrous tumor in the cavity of the uterus or upon its peritoneal

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[1] Lee: *Amer. Journ. Med. Sci.*, vol. xl. p. 344.   [2] *Researches in Obstetrics*, p. 397.
[3] From Duncan: *Researches in Obstetrics*, p. 383; also in *Annals of Obstetrics*, pp. 480, 489.

surface." West,[1] who denies the possibility of inversion "in the natural condition of an unimpregnated woman," admits that the "accident sometimes takes place spontaneously." Puzos in 1744 asserted that he had seen the accident "in women who had never borne children." Boyer (from Thomas) cites an example in a female whose uterus contained no foreign body. Baudelocque saw a case in a girl fifteen years of age who had had a sanguineous flow for about two years, in whom the hymen was perfect. The case of Taylor, before referred to, is even more conclusive. "After all," says Thomas, "there is nothing more astounding in the fact of spontaneous inversion of an undistended uterus than there is in the spontaneous reposition of one which has been long inverted ; and this we have, with the positive testimony of scientific and reliable men now on record, no possible justification for doubting."

Inversion most often begins at the placental site. Adhesion of the placenta, traction on or shortening and coiling of the cord, are admitted causes of inversion. Lee[2] studied his collection of 142 cases with special reference to the determination of the relative frequency of these factors in the causation of this accident. In 40 of the cases the data supplied by the reports were insufficient. The following analysis will therefore only refer to the remaining 102 cases : In 39 of these it is expressly stated that the inversion occurred from pulling on the cord, and in 7 from attempts to deliver the placenta. In 67 cases the placenta was adherent, in 31 of which it was detached after inversion. In 10 cases the cord was very short, and in several was twisted round the neck. In some cases the labor was precipitate, and the adherent placenta and inverted uterus simultaneously accompanied the expulsion of the child. In 79 cases there was present one or more of the conditions of adherent placenta, traction on the cord, or attempt to deliver the after-birth. These data point unmistakably to the placental site as the most common locality of primary introversion, and show that violence from within, either direct or indirect, was inflicted at that part. In 14 per centum of the cases the delivery of the placenta was spontaneous. There was neither manual nor artificial interference. The violence was physiological. It cannot be proven that puerperal inversion always begins at the seat of placental insertion, but the accepted belief, derived from observation, is that the initial depression occurs at that point in many cases, independent of any extraneous injury or force. If this be true, it must follow that the primary depression must be due to the structural condition of the muscular wall at that part, and that introversion is effected by morbid or irregular activity of the adjacent segment of the uterine structure, or

[1] *Diseases of Women,* 3d Eng. ed., p. 223.
[2] See also Crampton's collection of cases, *loc. cit.*

by the partial or complete inactivity of the organ. One part is weakened in action, whilst other and surrounding parts are in a highly excited condition. Duncan,[1] who has studied this subject more carefully than any author known to the writer, asserts that " the only condition essential to the production of puerperal eversion is paralysis or inertia or complete inaction," and that inversion cannot begin unless there is paralysis of the whole or a part of the uterus. It has furthermore been shown[2] that the fibres of the portion of the uterus where the placenta is found inserted increase less in volume than the rest, and undergo more considerable modifications of their structure." Rokitansky[3] describes the introversion of the placental site as a disease of the uterus after parturition. He says: "It is paralysis of the placental portion of the uterus occurring at the same time that the surrounding parts go through the ordinary processes of reduction. It induces a very peculiar appearance. The part which gave attachment to the placenta is forced into the cavity of the uterus by the contraction of the surrounding tissue, so as to project in the shape of a conical tumor, and a slight indentation is noticed at the corresponding point of the external uterine surface." He has observed this condition after abortion and after labor at full term. The placental portion becomes a uterine content, and is seized by the adjacent normal structures just as any tumor is in cases of inversion connected therewith. It thus appears that all the conditions necessary may be present for the inception and completion of an inversion independent of any artificial violence or improper care; nevertheless, it is entirely consistent with such a demonstration that the conditions of placental adhesion, shortening and coiling of the funis, and unskilful and unsuccessful detachment of the placenta should constitute very effective agencies in promoting, if not in directly producing, the displacement. Klob[4] asserts that inversion taking place immediately after delivery is either in consequence of precipitate labor or of the shortening or twisting of the umbilical cord, and probably also from incautious traction on it when the placenta is firmly adherent.

It is not improbable that the condition, as well as the position, of the placenta may promote introversion. It is quite reasonable to suppose that a large and heavy placenta firmly attached to a thinned and lax wall might drag inward the area of its attachment when the intra-uterine pressure has been removed by delivery, especially when the labor had been precipitate; and it is equally rational to conclude that placentitis and fibrous degeneration of the elements of union between it and the wall might produce such changes in the wall as would favor its depression.

[1] *Researches in Obstetrics*, p. 374 et seq.   [2] Dubois and Puzos, from Duncan.
[3] *Pathological Anatomy*, vol. ii. p. 229, Swaines' translation.
[4] *Pathological Anatomy of Female Sexual Organs.*

The foregoing considerations should admonish the accoucheur of the imminent danger of hasty and indiscreet interference during the third stage of labor, and of the importance of a careful examination of the uterine tumor in all cases in which the conditions referred to are present, before pronouncing the patient safe enough to permit his absence.

ETIOLOGY.—The causes are predisposing and exciting. The predisposing are—feeble and relaxed constitution; congenital defect of muscular contractility; parturition, at term or premature; primiparity; distension of the uterus, physiological and pathological; relaxation of the uterus; injury inflicted by frequent and rapidly recurring pregnancies and violence during previous or present pregnancy; uncontrollable vomiting; disturbance of the retentive power of the abdomen; large pelvis; erect posture during labor; irregular (Crampton) nervous excitement during pregnancy and labor; and " development[1] (Klob) of the larger follicles in the vaginal portion, in consequence of which the external orifice is dilated and the relaxed lips of the os uteri are gradually everted;" and laceration of the os.

Parturition, primiparity, and distension are the predominant influences. The occurrence of the accident after abortion or miscarriage has not been very frequent, and is usually associated with some direct agency. In Woodson's case[2] it occurred at the fourth month, in consequence of unusual effort and forcible extraction of the foetus by the patient herself; in Skae's case,[3] during the fourth month, caused by severe and continued vomiting; in Weist's, by previous hemorrhage at fourth month; in Sweeney's, at fourth month, by forcible removal of portion of the placenta; and in the cases of Brady and Warren, during the fifth and sixth months. In the latter case there was twin pregnancy, and the accident was attributed to a fall down steps. Other cases have occurred from similar causes at later periods of gestation.

The causal influence of primiparity is very clearly established by Crampton's statistics. In 176 cases in which the number of births is stated, 88 were first deliveries. No one has offered a satisfactory explanation. It must, therefore, for the present, be relegated to the general law of greater liability to casualties among the primiparæ.

Physiological distension occurs during pregnancy. Pathological dilatation may be induced by retained secretion, accumulations of fluids, and morbid growths. Klob considers inversion only very rarely possible after sudden evacuation of accumulated fluids, and then only in slight degrees. Distension produced by morbid growths is very gradual. In such cases inversion is most frequently the result of attempts at removal of the tumor, but spontaneous expulsion and inversion have occurred

[1] *Loc. cit.*   [2] *Amer. Journ. Med. Sci.*, vol. xl. p. 410.
[3] Crampton: *loc cit.*

quite often. The usual history of such cases is menorrhagia or metrorrhagia for an indefinite period, then pain like labor-pains, attended with hemorrhage, and expulsion of the tumor. In many of the cases uterine contraction is excited by the presence of the foreign body; in other instances it has been induced by artificial dilatation of the cervical canal. Johnston[1] reports a case of inversion caused by the spontaneous expulsion of a tumor weighing two and a half pounds. The morbid growth may be either sessile or pedunculate, and, except in very rare instances, is attached at the fundus. Klob refers to a case of "inversion of the posterior wall of the uterus caused by a fibrous polypus which was attached in the vicinity of the internal os."

EXCITING CAUSES.—Aveling[2] has divided the determining causes into automatic, systemic, and mechanical. Automatic inversion is caused by muscular contraction of the uterus, and is always of the fundal variety. Systemic inversion is usually the cervical, and is caused by contraction of the abdominal muscles or by a combination of the action of the abdominal and respiratory muscles. Mechanical inversion may be either propulsive or extractive, or both. Propulsion may be induced by blows on the abdomen, falls, accumulations of gas in the intestines, sudden and violent contraction of the abdominal parietes, and pressure of the superincumbent abdominal viscera. The extractive influences may be either manual or gravitatory. They refer especially to the considerations already set forth (see p. 698) relating to the frequency of the seat of placental insertion as the locality of primary depression. Similar forces are in operation when inversion occurs from traction on intra-uterine tumors or when the expulsion takes place spontaneously.

It may be stated, in the concise expression of Duncan, that "some part of the uterus must be in a position to be seized by the remainder." This condition may be consequent upon paralysis of the placental site, partial or total inertia, irregular contractions, after-pains, atony from distension or resulting from protracted or precipitate labor, or pregnancy at long intervals; inertia with traction on the cord; coiled, twisted, knotted, or short funis; large, heavy, or adherent placenta; unskilful and unsuccessful attempts at delivery of placenta; abortion; miscarriage; and traumatism.

SYMPTOMATOLOGY.—It is a singular fact, but nevertheless true, that inversion of the uterus has occurred and existed for a long time without giving rise to any "symptoms to attract (Reeve) attention or to indicate that anything has gone wrong." In such cases the size of the inverted organ is so diminished by contraction and involution that it forms an inconsiderable tumor, causing no inconvenience.

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[1] "Trans. Washington Obst. and Gynecol. Soc.," *Am. Journ. Obst.*, vol. xx. p. 961.
[2] *On Inversion of the Uterus,* p. 14.

A brief résumé of the symptoms of acute puerperal inversion is a necessary prelude to the discussion of the symptomatology of the chronic forms. When occurring suddenly, as it usually does, either during the third stage of labor or simultaneously with its completion, it is characterized by profound shock, marked by increasing exhaustion, pallor, coldness, and feebleness of the pulse, with profuse hemorrhage, and pain varying in intensity from maximum severity to a greater or less pelvic distress. There is a sense of fulness in the vagina or consciousness of something having escaped from the vulva. A physical examination discovers a soft, spongy, bleeding tumorous mass either in the vagina or extruding from the vulva, to which the placenta may or may not be attached. There is absence of a hypogastric tumor. If time permits and the thickness of the abdominal walls does not preclude its possibility, a cup-shaped excavation may be discovered by palpation behind the symphysis pubis, larger or smaller according to the interval of time between the completion of labor and its occurrence. In cases of partial inversion the subjective symptoms are not so marked or characteristic, and the physical signs are recognized with much greater difficulty; consequently, the accident in its initial stage very frequently escapes observation. The process of development progresses to complete inversion, and a shorter or longer period of invalidism elapses before the diagnosis is made. This delay is not so much due to the difficulty of making a diagnosis as to the failure of the attending physician to make a careful vaginal exploration. Metrorrhagia, dyspareunia, physical debility, leucorrhœa, discomfort in walking, standing, or sitting; more or less constant pelvic distress, sometimes with acute pain; a sense of vaginal fulness; dragging-down sensations about the pelvis, lower part of the abdomen, and back; vesical irritability, with or without tenesmus and dysuria, together with anæmia and a general constitutional condition indicative of continuous suffering,—constitute the ordinary subjective history of such cases.

Objective Symptoms.—The physical signs of chronic inversion are so similar to those of polypus that great care is necessary to differentiate the one from the other. The finger introduced into the vagina comes in contact with a pyriform tumor of variable size (Fig. 212) and firmness, with its small extremity above, surrounded by a firm ring. Around this ring the finger will sweep, but at no point can the finger or a probe be forced into the os or an opening. By recto-abdominal palpation and vesico-rectal manipulation the absence of the uterus from its proper position may be made out, and by abdominal palpation the cup-shaped entrance of the inverted cavity may be discovered. An examination with the speculum will disclose its color, mucous surface, and perhaps the orifices of the Fallopian tubes. Acupuncture will give pain,

Browne suggests that incision made into the tumor will determine the existence of the inverted cavity and positively exclude a solid tumor. Sometimes the diagnosis will be facilitated by drawing the tumor out of the vagina.

If the tumor be a polypus, a careful examination will discover the uterus (Fig. 211) *in situ.* The finger or a probe may be forced through the os. Acupuncture of the tumor will not give pain. If, as occurs in very rare instances, the os should be obliterated by adhesions (see Fig. 213), the presence of the uterus *in situ* must constitute the chief resource until an entrance can be made through the os into its cavity.

Partial inversion can be differentiated from polypus by discovery of the depression on the surface of the uterus, the diminution of its cavity, the circumstances of its occurrence, duration of invalidism, and pain from acupuncture.

Partial inversion, as shown in Fig. 210, produced by the dragging of a polypus on the internal surface of the uterus, is not so easily diagnosticated. A careful bimanual examination, made with a finger in the rectum, may detect the cup-shaped depression of the partial inversion, and the cavity of the womb is always enlarged by the presence of a polypus. If possible, a digital exploration of the cavity may also be of great assistance in detecting the presence of the tumor occupying the cavity of the womb.

In ordinary cases there is but little difficulty in making a diagnosis between chronic inversion and polypus. The introduction of a sound (Aveling) to the fundus will show the direction and depth

FIG. 210.

Uterine Polypus *plus* partial inversion (after Hart and Barbour).

of the cavity and position of the uterus (see Fig. 211); and the absence of the uterus from its normal position (see Fig. 212) may be proven by the contact of a finger in the rectum and a sound in the bladder. In cases of retroflexion of the uterus the retroflexion will be felt by the finger in the rectum, and may be mistaken for a polypus. In such cases the probe must be passed into the retroflexion; then, with a finger in the rectum, the position and mobility of the retroflexed body and fundus will be easily ascertained.

In occasional cases the polypus grows from or is attached mainly to the entire circumference of the os (see Fig. 213), and the diagnosis can only be made by the history of the case, the presence of the uterus *in situ,* the discovery of or the making of an opening through which the cavity can be measured, and the absence of the opening of the Fallopian tubes on the sides of the tumor.

When an inverted uterus protrudes from the vagina it may be mis-

taken for a prolapsus. In prolapsus the upper is the larger extremity; in inversion the lower is the larger. In inversion there is no orifice at the most dependent part; in prolapsus the os is readily found. In

Fig. 211.

Fig. 212.

Fig. 213.
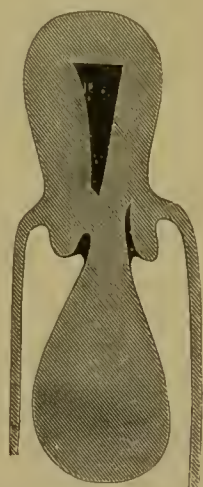
Fig. 211.—Uterine Polypus (after Thomas). The uterus in its normal position; sound passes into uterine cavity.

Fig. 212.—Inversion of Uterus (after Thomas). A cup-shaped depression is in the place of the uterus; sound arrested at the angle of flexion.

Fig. 213.—Uterine Polypus. Adhesion and pedicle obliterate cervical canal (after Hart and Barbour).

inversion a catheter will pass up behind the symphysis pubis into the bladder; in prolapsus it will turn downward into the cystocele, caused by the dragging of the bladder down with the procident womb. A rectocele is easily distinguished by a finger in the rectum; a cystocele, by the sound in the bladder.

In chronic inversion, whether partial or total, the uterus (Crosse) is subject to descent and prolapse, followed by all the complications, inconveniences, and dangers attendant on similar displacements of the uninverted organ. When of long standing prolapse occurs in a large proportion of the cases. When prolapsus takes place the vagina is necessarily inverted and may be dragged down externally, forming a hollow tube lined with the peritoneum; the bladder and rectum may also be brought down, and the vaginal pouch may be occupied by the intestines. In such cases the menstrual flow may take place from the inverted uterine surface. If the prolapse continues after the cessation of menstruation, the exposed mucous membrane assumes the appearance of the skin. In all such cases (Crosse) the patient is a loathsome, miserable object, walking with knees apart, suffering pain and discomfort from ulceration, inflammation, and even spacelation, the result of urinary incontinence, which is always present in such cases.

Course, Progress, and Termination.—Persistence of the displacement until it is reduced is the rule. There are, however, some very remarkable exceptions. Spontaneous reduction has taken place in cases reported by Meigs, Spiegelberg, Leronx, De la Barre, Thatcher, Rendu, Shaw, Baudelocque, Fonjen, and Huckin, in all twelve in number.

Inversion may exist without the knowledge of the patient, but the usual course is one of continuous and increasing suffering until it is reduced. In occasional cases the subjective conditions abate with the progress of the process of involution. When it is completed, months after the occurrence of the accident, recovery of the general health may follow.

Duration does not constitute an obstacle to successful treatment. Tate succeeded in a case of forty-two years' duration. In this case the inversion occurred simultaneously with the completion of labor, and at the time of treatment was associated with vesicocele and rectocele. It was reduced by the method of Courty, with pressure through the bladder.

Prognosis.—Crampton rates the general mortality at 20 per centum. Some die from shock or hemorrhage; some, from exhaustion after long-continued suffering and recurring hemorrhages. Some cases are sooner or later complicated with fatal cellulitis or peritonitis. The mortality of acute inversion is larger than of the chronic. Of Crampton's collection of cases, 32 of the 120 recent cases died; of the 104 chronic cases, 7 died. Crosse fixes the mortality of the acute form at one-third.

The dangers are not limited to the nature of the displacement and circumstance of its occurrence. Errors of diagnosis and methods of treatment, as well as unskilful execution, have contributed largely to the mortality. Many inverted uteri mistaken for polypi have been amputated. Ablation has added its quota, and rude and crude attempts at reposition have not been free from fatal complications.

So often have mistakes in diagnosis led to disastrous results that one feels mortified at the carelessness and ignorance with which physicians have approached such a grave disorder. But mistakes resulting in death have not been confined either to the ignorant or careless. Some of the most renowned of the profession have committed, seemingly, inexcusable blunders in diagnosis. At the present time, with the improved methods of examination and advances in scientific knowledge, similar mistakes would be criminal.

Treatment.—The expectant plan of treatment consists in permitting the displacement to remain, and attempts by local applications and general medication to modify and alleviate the subjective symptoms. It is purely symptomatic. In the present state of scientific

medicine it is wholly inexcusable. Human nature is oftentimes very tolerant of useless and perhaps injurious methods of medical treatment. With a knowledge of the fact that duration is not an obstacle to successful reposition, as shown by the success of J. H. Tate in a case of forty-two years' standing, it is incredible that any physician would follow the expectant plan any longer than was necessary to prepare for some more scientific and successful procedure. If, however, methods of reduction have failed after proper and skilful efforts, and the issue of expectancy or ablation arises in patients approaching the menopause, when menstruation will soon cease and atrophy begin, it may not be injudicious to attempt by the local application of hæmostatics to arrest the bleeding and promote atrophy. Aran claims to have succeeded in arresting the hemorrhage and reducing the tumor by dragging down the inverted organ, so as to expose its entire surface, and freely applying the actual cautery, potassa cum calce, or one of the caustic mineral acids, then washing "with a neutralizing fluid, and enveloping it in lint before replacement in the pelvis." Thomas suggests in this connection that any method which will transform the investing mucous membrane into a skin-like integument, as nature has done in several cases of long standing, commands thoughtful consideration.

Ablation.—Ablation is performed by incision, ligation, écrasement, and cauterization. In the earlier times it was the most common method of treatment. Now it is rarely resorted to, and only as a *dernier ressort.* So many conservative and safer procedures have been devised, mostly by Americans, during the present century, that amputation would only be considered in exceptional cases after absolute failure of taxis and other cutting operations. The mortality from ablation is about 30 per centum.

The objections to the operation of ablation are the possibility of removing a part of the intestine, which may be enclosed in the inverted cavity, profuse and fatal hemorrhage, the production of artificial emansio-mensium, and resulting sterility.

Ligation alone, and amputation either with the scissors or knife, are more dangerous than the other methods of ablation. Incision and the écraseur, preceded by the ligature, are usually attended with profuse and alarming hemorrhage. McClintock devised the method of obliteration of the vessels by ligation several days before the operation. The galvano-cautery has not obviated the dangers of the operation of ablation. Courty[1] insists that the elastic ligature "is a method which presents more advantages and fewer dangers than any other." He employs the elastic ligature by means of an india-rubber tube, tightened moderately the first day, and more every succeeding day till the tumor falls; which it generally does from the twelfth to the eighteenth

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[1] *The Uterus, Ovaries, and Fallopian Tubes,* p. 459.

day. Previous to its application a groove should be made by the thermo-cautery, in which the ligature will rest. Hegar and Kalten-bach pass a ligature through the neck, high up, which constricts the vessels and closes the peritoneal cavity, and then remove the body. In all these methods of ablation strict antiseptic precautions should be adopted and the pain should be relieved by the use of morphia.

Other Cutting Procedures.—Thomas' "method consists in abdominal section over the cervical ring, dilatation with a steel instrument made

FIG. 214.
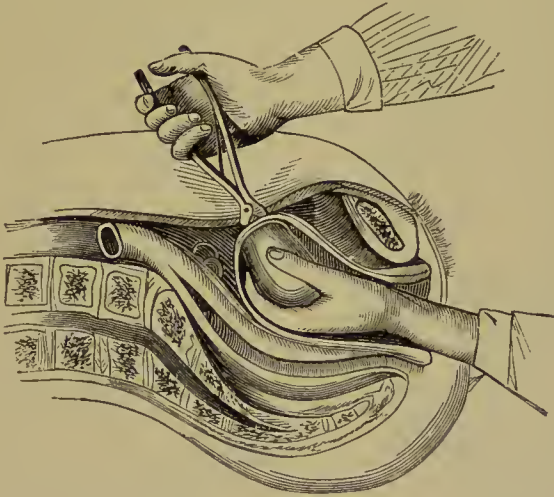
Replacement of Uterus by Dilatation through Abdomen.

like a glove-stretcher, and reposition of the inverted uterus by some one of the methods" hereafter described. The operation is certainly safer than, and preferable to, amputation.

Browne[1] describes his operation as follows : "The inverted fundus is drawn outside of the vulva with a strong volsella forceps, until the openings of the Fallopian tubes are plainly in view ; then an incision one and a half inches in length is made through the posterior portion of the uterus (avoiding the tubes and larger vessels at the sides). Through this incision Sims' large dilator is passed up into the cervix, and expanded to the fullest extent until the tissues of the cervix are felt to relax ; then withdrawing it and passing through the cervix Nos. 2 and 3 of Hank's hard-rubber dilators. The incision is then sutured, and the inversion is reduced by manipulation."

Each of these operations is applicable to a similar class of cases. Neither is suggested as a substitute for more conservative methods, but as a safer procedure than ablation and as an alternative when taxis fails. Their comparative advantages must depend upon the relative danger of an incision through the abdominal and uterine walls. It

[1] *New York Med. Journ.*, Nov. 24, 1883.

seems to the writer that a laparotomy is less hazardous than a sutured incision of the wall of an inverted uterus, which may be reopened during the reduction (which must follow immediately), and remain concealed from inspection in the abdominal cavity. Neither of them has been performed sufficiently often to determine its value.

Barnes' Method.—Having failed in attempting to reduce an inversion by Tyler Smith's method, Barnes succeeded by drawing down the inverted organ to the vulva by a slip-knot of tape : he made three incisions across the fibres of the cervical sphincter, and then, by compressing the uterus with one hand and maintaining counter-pressure over the abdomen with the other, the inversion was speedily reduced. He does not, however, advise this method until other more conservative procedures have failed.

FIG. 215.
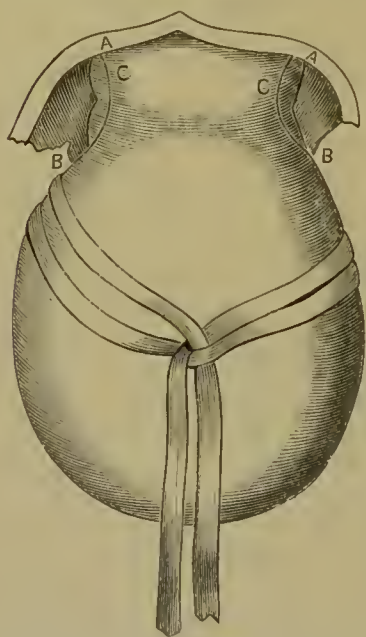
Inverted Uterus drawn down by a tape-noose : *A, C, B,* line of incision in cervix in Barnes' operation (Barnes).

Methods of Reposition. — Previous to the year 1858 few cases of chronic inversion of the uterus had been successfully reduced. Those few had been accomplished by taxis. They were regarded, however, as illustrations of accidental dexterity rather than proof of any well-devised system which might be applicable to all cases without regard to the duration of the displacement, or one that would supplant the mutilating operation which had been previously so frequently resorted to. During the year 1858 the late Prof. James P. White of Buffalo, N. Y., and Tyler Smith of London published the successful result, with the description of their methods, of uniform and sustained pressure. Since then many modified and auxiliary procedures have been devised and successfully applied. The methods of White[1] and Smith[2] were essentially different, though alike in that they secured uniform, elastic, and sustained pressure. Priority undoubtedly belongs to our distinguished countryman. The result of these and other allied modes has been so satisfactory that the prediction of White in 1858 is realized in the assertion of Aveling in 1887, that "every case of inversion can be cured by reposition."

Before proceeding to execute any method of reposition it is

[1] First case, February, 1856 ; second case, March 12, 1858.
[2] First case, April 24, 1858.

deemed advisable by some operators to employ preparatory treatment, such as posture, hot and cold vaginal douches;[1] belladonna, either in the form of vaginal injections, application of the ointment to the neck of the uterus, or rectal suppositories; compression and dilatation of the cervical ring; incisions on the surface of the inverted organ; and division of the cervix by introducing a bistoury through the inverted fundus. It is satisfactory, says Aveling, to know that "all these aids to reposition concern us only as of historical interest," and are no longer necessary or expedient.

Methods by Repositors.—Previous to the discovery of White—which was, in fact, in 1856—several methods of reposition had been devised and practised with only very rare and uncertain success.[2] Simple manual compression, with continuous pressure, associated with attempts to indent the fundus—which was, perhaps, the oldest plan—proved impracticable, because of the impossibility of maintaining the compression sufficiently long to accomplish any result beyond actual injury. Viardel in 1674 published a description of his rod (Aveling) with rounded ends. Subsequently, Chailley Honori bent the rod to conform to the pelvic curve. Madame Boivin suggested rods with cupped ends. Later, Barnes and Braxton Hicks modified the repositor of Von Siebold, which consisted of a curved stem surmounted with a sponge. Hicks covers the end with india rubber, and Barnes attaches a hollow rubber cup to a curved stem. These are retained in position by a T bandage. The progress of discovery advanced from a straight to a curved stem, and from the round to the cup-shaped end of the rod. In this advance three important principles were developed and verified: First, that the force must be in the direction of the pelvic curve; second, that reposition began at the cervical ring, as described by White, by dilatation and reflection of the os over the neck and body consecutively (the fundus is not dimpled at the centre or either horn, and is not reflected upon itself); third, that uniform, elastic, and sustained pressure upon the fundus in the line of the pelvic curve produces dilatation of the os, followed by its reflection over the cervix, and by gradual expansion of the cervix and body as they roll back through the os until the fundus is replaced in its normal position. In other words, the process of inversion is reversed, and reposition begins where inversion terminated.

Smith's Method.—This method is a combination of elastic pressure and manipulation. The uterus is kneaded twice daily with the hand passed into the vagina, and during the intervals elastic pres-

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[1] Martin of France succeeded in a single case by throwing a stream of cold water upon the fundus.

[2] Five cases cited by Thomas: *Diseases of Women*, 5th ed., pp. 463, 467; also, Emmet, p. 415, 1st ed.

sure is maintained by an air-pessary retained in the vagina by a T bandage.

Teale and Bockenthal succeeded with the air-bag without resorting to uterine massage.

"Thiry has devised (Hart and Barbour) an ingenious bag consisting of a double-walled india-rubber capsule, which is slipped over the uterus; when distended with air it compresses and pushes up the inverted uterus."

Thomas has improved the method of sustained pressure by the use of elastic bags. He fixes the inverted organ in position by firmly tamponing around it "with carbolized cotton soaked in glycerin," and then introduces an india-rubber bag filled with water, which is retained in position by a "strip of adhesive plaster extending from the lumbar region between the thighs and as high up as the navel." The advantage of this device is that the pressure can be increased or diminished without disturbing the adjustment of the apparatus, either by injecting more water into the bag or lessening the quantity by turning the stop-cock in the tube. The use of elastic bags, filled either with air or water, has, however, been superseded by other methods, which are more effective and less cumbersome.

White's Method.—The construction and action of the uterine repositor will be readily understood by reference to the accompanying cut.[1] "The instrument is composed of a stem of wood or hard rubber curved to conform to the vaginal curvature, with a coil of steel wire attached to the outer extremity, whilst the other end is expanded and hollowed so as to receive the fundus of the uterus in its concavity or disk. The edge of this disk is tipped with soft rubber, being an inch and three-eighths in diameter and about half an inch deep. The concave extremity of this instrument is carried up into the vagina and placed in contact with the fundus, and then firmly held by the hand in the vagina. The outer end of the instrument, or the coil of wire, is placed against the breast of the operator on a level with the uterus. By means of this large circular spring the instrument readily keeps its place on the clothing of the operator, and leaves the other hand free to be used above the pubes to assist in fixing the uterus, and assist also in forcing open the dilating os, which can ordinarily be plainly felt through the abdominal walls.

"The spring at the outer end of the instrument enables the operator, without danger of lacerating the tissues, to keep up a constant gentle pressure upon the fundus, and by leaning forward to increase the pressure intermittingly. The force thus exerted is applied more directly upon the fundus by means of the repositor than would be possible if the thumb and fingers were used. . . . .

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[1] *Transactions of the International Medical Congress*, Philada., 1876, p. 880.

"The intravaginal hand compresses the body and fundus and lessens its vascularity, whilst something is gained by intermitting the pressure, also lessening by its use the exhaustion incident to intermitting muscular effort of the operator."

The patient should occupy the dorsal position, with the buttocks

Fig. 216.
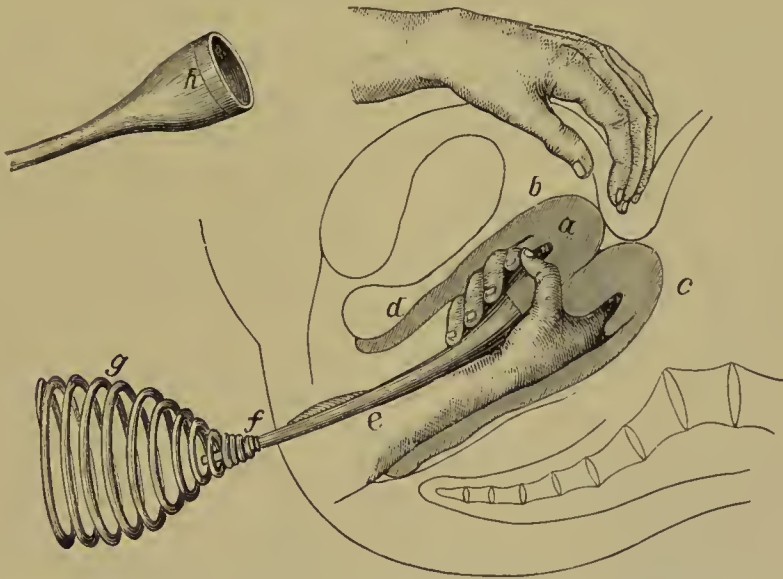
Rapid Reduction by White's Method. Operator grasps uterus, *a*, and presses his chest against spiral spring, *g, f*, which forces cup of repositor against fundus. *b*, "anterior lip or wall of uterus, with the fingers of left hand pressing upon it and assisting in pulling open the uterine cavity ; *c*, posterior uterine wall semi-reflected ; *a*, anterior vaginal wall ; *e*, wooden or hard-rubber stem of repositor, its enlarged extremity held in contact with the fundus by the intra-vaginal hand of operator ; *f*, distal extremity of stem made into a screw, so as to be fastened into *g*, a coil of No. 11 steel spring wire, requiring eight or ten pounds pressure by the breast of the operator, against which it is placed, to bring it down ;" *h*, uterine extremity of stem *e*, which is terminated with a soft-rubber disk 1¾ inches diameter, the concavity into which the fundus is received being about one-half inch deep, with its terminal margin thin and soft (after White).

drawn to the edge of the bed and each leg securely held by assistants. The operator should occupy a position between the extremities of the patient. Anæsthesia should be pushed to complete insensibility.

Aveling's Method.—The sigmoid-cupped repositor devised by Aveling is based upon the theory that axis-pushing "in the direction of the upper axis of the pelvis" is superior to any other method in "ease of performance,[1] painlessness, safety, rapidity, or unfailing action." Reduction takes place, as with White's repositor, by the cervical method.

The size of the cup should be, in diameter, slightly less than that of the fundus. To adjust the apparatus a belt should be applied round

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[1] It is due, however, to Dr. Aveling to state that he expressly excludes the cases treated by White's method, which he characterizes as "a combination of taxis and violent pressure by means of a ten-pound spring against the chest."

the waist and fastened to braces over the shoulders by safety-pins. "This should be done in such a way as to leave room to pass the tapes, to which the rings are attached, between the pin of the safety-pin and the belt. Now the cup of the repositor should be applied to the fundus uteri, and held firmly in position by an assistant while the rings are adjusted, two being taken in front and two behind. The ends of the tapes should next be passed between the safety-pins and the belt, points of the tapes drawn through, and a knot made at the ends to prevent them slipping back." Tension to a greater or less degree can be secured either by tightening or loosening the tapes. Tension must be equally distributed, and the parts must be protected from the pressure of the elastic bands or tapes. The patient must be confined to the bed, and, if necessary, morphia must be given and the bladder evacuated by the catheter.

Fig. 217.

The Sigmoid Repositor applied: *A*, line of pressure; *B* and *C*, traction lines of elastic bands (after Aveling).

Aveling states that in eleven successful cases the pain was not excessive in a single case, and in only one were there any unpleasant after-consequences. The time required for reduction averaged about forty hours, the longest being fifty-four and a half hours, the shortest nine hours. A pressure of two and a half pounds is usually sufficient to effect reduction. The repositor should not be removed too soon, and when removed a sound should be passed to ascertain whether the fundus is completely restored. He subsequently reports an unsuccessful case.

The principle of action in the methods of White and Aveling is identical, but the manner of evolving the force is essentially different. In one the elastic pressure is derived from a steel spring and directed, through an inflexible rod "curved to conform with the curve of the vagina," against the inverted fundus; in the other the elastic force is derived from elastic bands and exerted upon the fundus through a sigmoid inflexible rod in the direction of the axis of the superior strait of the pelvis. White's is more rapid, more painful, and perhaps more hazardous; Aveling's is certainly less laborious to the operator.

Wing develops elastic pressure by another very ingenious contriv-

ance. He adjusts against the inverted fundus a rubber ring in which is placed a round plug of polished wood. The external end of this plug is fastened at the crossing of two pieces of rubber tubing which pass between the thighs and are attached, two ends in front and two behind, to a belt around the waist. The ring keeps the fundus in place, and the rubber tubing maintains continuous elastic pressure.

Byrne has practised a different method. His instrument consists of a hard-rubber cup, varying in size to fit the fundus, in which a plate is so fixed that it can be propelled by a screw against the fundus. Another cup with a movable cone is adjusted to the abdomen and screwed down into the cervical ring. The plate in the vagina is then slowly propelled against the fundus, whilst counter-pressure is maintained by the cone inserted into the cervical ring.

Methods of Manual Reduction.—Emmet's method consists in encircling with the fingers and thumb that portion of the body close to the seat of inversion, while the fundus rests in the palm of the hand. This portion of the body is "firmly grasped, pushed upward, and the

Fig. 218.
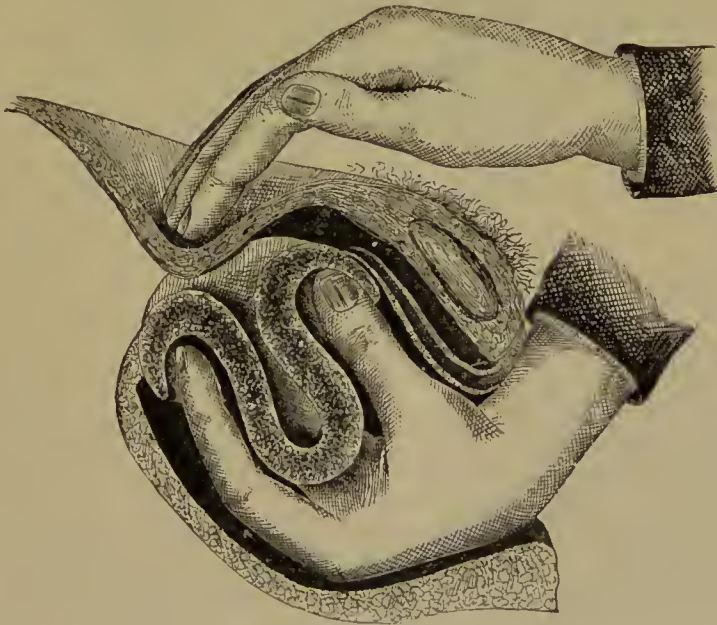
Emmet's Method of Reducing an Inverted Uterus (after Emmet).

fingers then immediately separated to their utmost; at the same time the other hand is employed over the abdomen in an attempt to roll out the parts forming the ring by sliding the abdominal parietes over the edge." This manipulation is repeated and continued. After the body has advanced well within the cervix steady upward pressure upon the fundus is applied by the tips of all the fingers brought together.

Courty's Method.—The cervix is first drawn outside of the vulva with Museux's forceps; then the index and middle fingers of the left hand are introduced into the rectum and pushed upward and forward so as to fix the cervix; then, seizing the uterus with the right hand, it

FIG. 219.
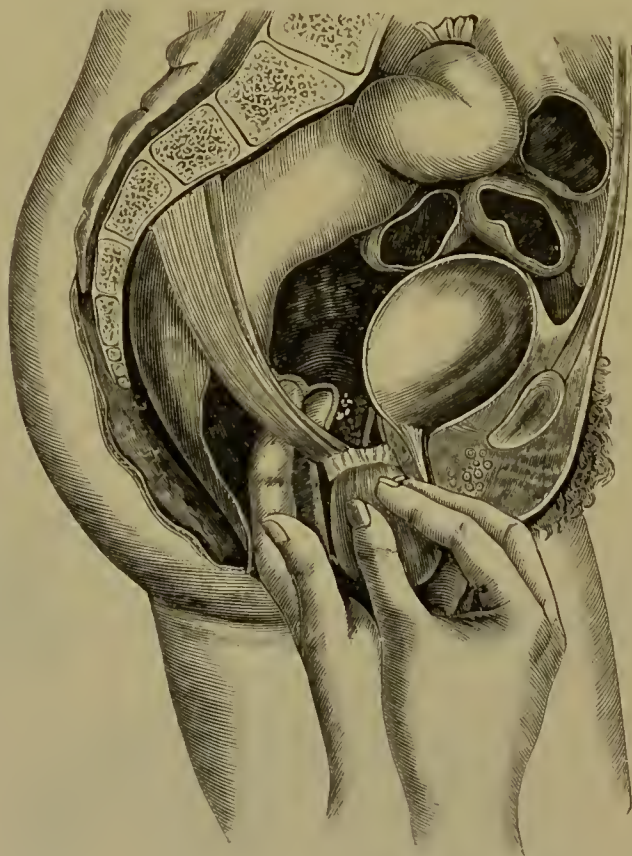
Position of the Hands in Reducing Inversion by Courty's Method. The two fingers of the left hand are curved to retain the cervix; the fingers of the right hand push back the uterus, commencing with the parts which have escaped last. The utero-sacral ligaments are exaggerated, and the bladder has been left in its usual place (after Courty).

is pushed back into the vagina. With the thumb and index finger of the right hand pressure is made on the pedicle of the tumor, so as gradually to increase the depth of the utero-cervical groove, and thus by uniting taxis on the body with immobilization of the neck reduction is effected without violence.

Noeggerath's Method.—This consists in the effort to invert one or both horns of the inverted organ by making pressure against one horn with the thumb, and against the other with the index finger. When both horns have been inverted, central pressure is made until reduction is accomplished. Counter-pressure is made with the other hand over the cervical ring. This method seems very simple, but should be

practised with great caution, or the fingers might penetrate the uterine strnctures. Thomas declares it applicable only after reduction of the neck.

Tate's Method.—This is a combination of the methods of Courty and Noeggerath. It is accomplished by fixing the neck by inserting three fingers into the ring, one of one hand introduced through the
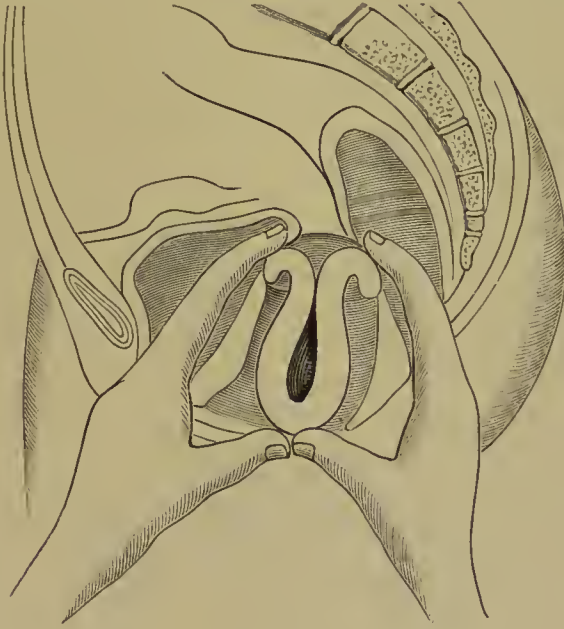
After Mundé.

nrethra, and two of the other hand into the rectum, and making pressure against both horns with the thumbs. Tate succeeded after half an hour's effort in completely reducing an inversion of forty-two years' duration.

Barrier's Method.—He compresses the uterus with the whole hand, and seeks to indent the fundus with the thumbs. Counter-resistance is made by forcing the cervix against the sacrum.

Watt's Method.—He has succeeded by a combination of the methods of Courty and Tate. The uterus was drawn partially out and seized by one hand. Two fingers of the other hand were passed into the rectum, and one of them inserted into the ring. The grasped uterus was then forced upward against the finger in the ring. As soon as the dilatation of the ring would permit, the other finger was inserted, and then by continuing the pressure of the uterus against the fingers reposition followed.

Meissner's Method.—He grasps the uterus with four fingers of each hand, and applies the thumbs to the lowest part of the inverted fundus.

The object is to make a depression at that point, and (Charpentier) to increase it by gradual and moderate pressure.

Valentin in 1847, and Quackenbush in 1855, succeeded, each in one case (Emmet), by dilating the vagina with sponge tents, then seizing the uterus with the fingers and thumb of one hand, made pressure, whilst the other hand grasped the hypogastrium. Etherization was carried to the extent of producing relaxation of the sphincters.

No one of these methods, manual or instrumental, is applicable to every case. The clinical history of the patient, duration and cause of the inversion, and size and condition of the organ should be considered in the selection of the method of reposition. As a rule, the gentlest and least dangerous procedures should be first tried. Nor should any one method be persistently adhered to, to the exclusion of others. The failure of one after a reasonable trial suggests an attempt with some other. It is equally true that no method should be hastily abandoned for the mere purpose of substituting another. No operator should attempt any of the methods, manual or instrumental, which require the presence of assistance or continuous physical effort without the presence of such skilled assistants as could render the necessary aid or take the place of the operator in the event of his exhaustion. It might happen that just at the moment of greatest importance one or both hands might become powerless to complete the reduction, or that general exhaustion from a continuous constrained position or effort might surprise the operator when patience and endurance were most needed.

In those cases where the method employed is manual, or executed by an operator, the patient should occupy the dorsal position, with the buttocks drawn to the edge of the bed and elevated on a cushion. The legs must be held and supported by competent assistants.

When one or more of the gentler methods have failed after a reasonable trial, a more vigorous procedure may be substituted; but it is never prudent to follow one effort or method immediately by another. Sufficient time should elapse to allow the patient to recover from any ill effect and to be assured that no injury has resulted from the previous attempt.

Before making any effort at reduction such preliminary treatment as the exigencies of the case may demand should be employed. The condition of the bowels should be attended to—a free evacuation should be secured daily for several preceding days; the vagina should be syringed daily, or oftener if deemed necessary, with hot water, and it may be prudent to accustom the vagina to the manipulation by the introduction of the hand. The diet should be regulated and every precaution adopted to avoid complication or interruption. No operation should be undertaken during the menstrual period unless the peril of the patient from hemorrhage forbids delay. In all cases when

reduction is possible at a single trial of any method, manual or instrumental, anæsthesia to a greater or less degree, usually to complete insensibility, should be induced. It not only protects the patient from suffering, but it is the most valuable of all aids to any method of reposition.

In those cases where an adjustable apparatus is employed, which is to be retained in position for a period of time, anæsthesia is not necessary; but the patient must be confined to bed and strictly enjoined to avoid every movement likely to disturb the adjustment of the repositor. Examinations should be made daily or oftener to discover any displacement of the apparatus. Such patients should be kept free from pain by the use of morphia. In all cases after reduction, however accomplished, the patient should be confined to bed for a shorter or longer time; the diet should be restricted, and such general regimen should be enforced as may secure immunity from inflammatory or other complications; and if any such result should follow, prompt and appropriate treatment must be employed. Careful examinations should be made at intervals during the convalescence to discover any

FIG. 221.
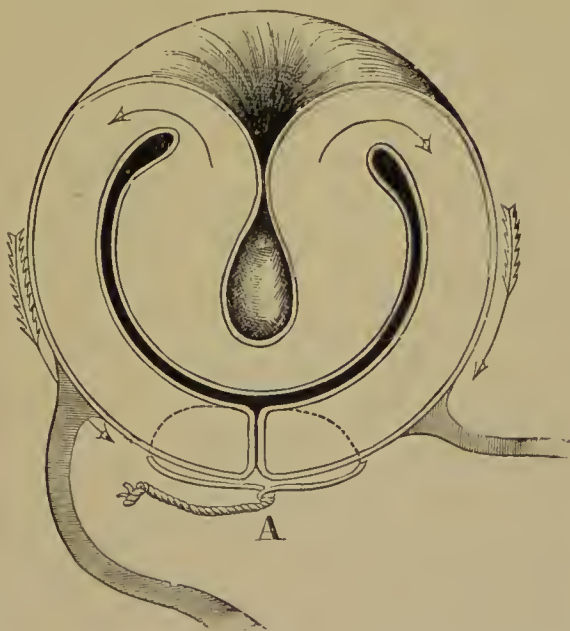
Diagram showing direction of traction exerted by sutures in cervix uteri after partial reduction of inversion (after Emmet).

recurrence of the displacement. Hot water and antiseptic vaginal injections may become necessary—in fact, may be important accessories to the management of the period of convalescence. Ergot may also

contribute to the security of the patient from recurrence. The exercise and employment of the patient should be supervised.

When the inversion has been caused by a polypus or other intra-uterine tumor, such growth must be removed before attempting reposition. In such cases antiseptic after-treatment is more important than in the others. Precautionary measures against more probable dangers should be even more strictly enforced. In such cases the area around the attachment to the internal uterine surface is believed (Scanzoni) to have undergone fatty degeneration or (A. R. Simpson) malignant infiltration.

In those cases where the effort at reduction has to be abandoned before the reposition is accomplished, and in those where there is liability to immediate recurrence, Emmet has devised and practised the procedure of closing the os by drawing the lips together with several interrupted silver sutures. In this manner he has also accomplished complete reposition in cases where by manual effort the fundus has been reduced within the os. The drawing of the lips together not only offers a fixed obstacle to descent of the partially-reduced fundus, but, as very correctly stated by Emmet, establishes a force which is continuously operative in promoting complete reposition.

INJURIES AND LACERATIONS OF THE PERINEUM AND PELVIC FLOOR.

By HOWARD A. KELLY, M. D.,

PHILADELPHIA.

INTRODUCTORY.—For the following article the author has largely drawn the material from his own practice, which has been peculiarly rich in cases falling under the above title. The views derived from this source have been supplemented by condensed statements of his deductions from the writings of others. The endeavor has been made to treat the subject in a practical and useful manner, leaving historical questions and a statement of the abundant and original American work in this field until a future opportunity. Much is here said about " the recent tear," as the author holds it a matter of prime importance that injuries to the pelvic floor and perineum should be treated as soon as possible after their occurrence. He further believes that the recent tear is the form to which secondary tears must be reduced by proper denudation, when the method of suture in both will be alike.

The prominence given to " Relaxation" as the most important of all injuries will, it is hoped, if at first questioned, gain general acceptance, and thus hundreds of sufferers may secure relief who are to-day looked upon by gynecologists as having sound perineums. To mention all indebtednesses would be to fill pages with names, but it is impossible to omit special mention of my friends T. A. Emmet and Friedrich Schatz, and express many obligations both for direct teachings and germs of ideas which have proven pregnant with important facts.

The PELVIC FLOOR is a thick, powerful diaphragm of interlacing tendinous, muscular, and connective tissues closing the outlet of the bony pelvis, stretching from the pubic rami and ischia to the sacro-sciatic ligaments and coccyx. Viewed from within in the female, the floor has the shape of a shallow funnel with an excentric outlet, the vagina, displaced to the front. Its principal strength lies in three systems of muscular fibres forming the sloping walls of the funnel. The posterior set extend from the spines of the ischia to the coccyx; the middle arise from the margins of the ischia and meet in a tendinous raphé connecting the anus and coccyx; the anterior comprise the

levator ani muscles of either side. This strong elastic bed is pierced by the outlet of the rectum and the outlet and inlet of the vaginal canal in the female.

The PERINEUM is that portion of the pelvic floor which lies between the anus and the extremity of the rectum and the posterior commissure of the vulva. (See Fig. 222.)

Under the ordinary conditions of health and normal functional activity this floor readily preserves its integrity, supporting both outlets in their proper relative positions, thus retaining the pelvic viscera lying immediately above, and effectually resisting the additional strains to which this part of the body is subjected in consequence of the erect posture and woman's activity as a laborer. It is due to the erect posture that the greater part of the repeatedly recurring impacts of walking and quick movement are spent upon this floor of the pelveo-abdominal cavity—a disadvantage not experienced by the quadrupedal mammals, in which these forces are distributed over the muscles of the abdominal wall. Upon severe exertion also, when the breath is held and the abdominal walls fixed, and the whole muscular system called into action, a great increase is added to the ordinary intra-abdominal pressure, felt equally in the pelvis and spending itself to the greatest disadvantage upon an unsound pelvic floor.

FIG. 222.
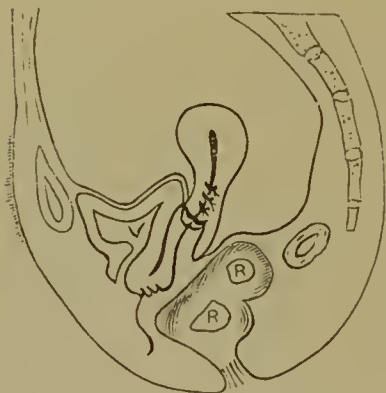
Section showing Actual Thinness of Normal Perineum.

INJURIES FROM WITHOUT.

The pelvic floor in woman is so well protected by the thighs and overlapping buttocks on either side, and by the powerful sacral wedge posteriorly, that it is but rarely injured by forces acting from without, unless associated with general injury and crush or contusion of other far more important structures, as frequently occurs in railroad accidents. We would thus naturally expect to find, what is indeed a fact, that the accidents most commonly recorded have been occasioned by long pointed instruments, which readily find their way between the thighs and pierce the floor: thus, women have frequently been injured by contusion or penetration of the pelvic floor from mounting a rickety chair, which breaks under the weight of the body, and falling on one of the upright pieces. Many women have been gored in this portion of the body by horned cattle, and children are often impaled by sliding down a haymow upon a concealed pitchfork. Several cases have

come to my notice in which little girls have had their perineum torn from vagina to anus, opening the whole recto-vaginal septum, by sliding down a baluster and striking the flat boss on the top of the newel-post.

Rape leaves indelible traces on the vaginal outlet and perineum, most marked in little girls, the extent of the injury being manifestly directly as the disproportion between the size of the orifice and the penetrating object. In one of the frightful records of barbarity in the West is a case, an example of others not always confined to savagery, in which a party of Indians, after killing a settler and his wife, took an infant daughter, and, to carry out their purpose, slit the perineum and recto-vaginal septum with a bowie-knife, and in turn raped the dying child.

Although the changes at the vaginal outlet, exclusive of the conditions of the hymen following sexual indulgence, are, as a rule, distinct and easily demonstrable, injury to the pelvic floor and perineum from this cause is rare. In a curious case observed by Dr. Joseph Price the horny penis of the husband perforated the perineum of his wife on their nuptial couch, leaving a permanent vulvo-rectal fistule, through which coitus subsequently took place. Sir Spencer Wells has also reported a similar case of injury. Improperly-made specular examinations and the use of the obstetric forceps frequently result in damage to the vaginal outlet, producing relaxation and laceration, resembling, however, the injuries of parturition, with which they will be described.

TREATMENT.—Where the pelvic floor is injured from without and special treatment of this injury is called for, apart from such treatment as is required by the other and graver associated injuries, the surgeon must be guided in general by the principles governing the treatment of lacerated, contused, or incised wounds elsewhere.

Contusions should be treated expectantly, with cooling evaporating lotions, making free incision upon the first sign of pus-formation as shown by tumefaction, pain, heat, elevation of body temperature, and fluctuation. Lacerated wounds with contused margins must be drained, with the approximation by suture of such parts as are sound. Simple lacerations or incised wounds should be closed at once by interrupted silk or gut sutures.

The cardinal principle throughout must be absolute cleanliness, best attained here by a rigid antisepsis, washing the wound thoroughly with a 1 : 1000 solution of bichloride of mercury, and dressing it with absorbent cotton, protecting it from the air. Especial care must be taken to prevent fecal contamination, to remove vaginal secretions, and to exclude permanently irritants from these sources from the parts involved. This is best accomplished by separate suture of the rectal and vaginal walls, when either canal is opened. The entrance of septic

material from these tracts upon the wound surface is the chief source of irritation, preventing primary union. Buried continuous or interrupted buried sutures of catgut (*vide* p. 751) give the quickest, surest, and best union of deep wounds, avoiding the common danger of attempting to grasp too much tissue in a single layer of deep external sutures.

In lacerations confined simply to the skin and tissues more or less superficial, interrupted sutures of fine silk or silkworm gut should be employed, embracing the whole wounded surface, and numbering from four to five to the inch, accurately approximating the skin margins between with superficial sutures. Over the wound thus closed or drained a dressing of bichloride gauze or carbolized cosmoline of 5 per cent. strength should be placed and held by a bandage. The dressings should be changed as often as soiled.

Injuries from Within.

Just as the sources of injury to the pelvic floor, acting from without, are diverse and rare, correspondingly uniform is the cause acting from within. To the parturient function women owe their great liability to the frequent injury of this portion of the body.

From disproportion of one sort or another, either in the size of the fœtus or in the size of the outlet, or in the time taken by the fœtus to displace the floor and dilate the outlet, destruction of tissue by pressure, tear, or over-stretching of the fibres crossing the floor and closing the vaginal outlet is a frequent result. So common indeed is their occurrence, and so serious in their consequences are the injuries thus sustained, that they bid fair to overshadow in importance any other single surgical affection.

The normal functional activity of the vaginal outlet, the excentric vent of the funnel above described, the most contracted and resisting part of the infra-uterine parturient canal, makes it necessary that a ring not greater in circumference than from two and a half to three inches should at the delivery of the child dilate to thirteen inches, and that after labor it should return to its former size and strength, continuing to support the vaginal outlet and preventing hernia of the structures above.

Function of the Perineum.

A correct appreciation of the function of the perineum and the vaginal outlet is better obtained by studies made upon the living subject, making careful comparisons between multiparous and nulliparous women and virgins, under varying conditions of pressure upon the

pelvic diaphragm, than by frozen sections which represent but a single plane at one time, and in which all parts are of equal consistence. The study upon the living subject is better also than that made upon the cadaver, where the post-mortem relaxation of all muscles exercising sphincter power is at once misleading as to the most important features of the investigation. The examination of the living subject should be conducted in the following manner: Introducing one finger into the rectum, and carefully palpating with the other hand over the skin surface of the perineum upward from the anus, over the fourchette, and into the vagina, the fact is at once evident that, without exception, in all nulliparous women the anterior rectal wall arches upward and forward and lies directly behind the skin perineum (Fig. 222), and that the thickness of the tissue between the finger in the rectum and the outside finger is rarely more than a fourth of an inch, and there is nothing more than skin, rectal wall, fat, and small muscles between the fingers. At the fourchette, where the depth of the perineum is greatest in the frozen section, giving it its imposing wedge form, the superficial tissues are felt in the living to be utterly lax and nothing more than the loose drapery of the outlet. It will be further observed also that in women who have never borne children the gluteal cleft is deep and sharp-angled, and the anal outlet has the appearance of being tucked up under the pubic arch, and the perineum is very small and shallow in every measurement.

The true supporting structure of the outlet is discovered by further careful palpation of the posterior vaginal wall, which reveals at the introitus, just behind the hymen, a broad band of powerful resilient fibres extending transversely behind the vagina from the pubic ramus on one side to the pubic ramus on the other. This band or sling of muscular fibres is in some measure under voluntary control, and can, with the direction to the patient to " draw up," be made to pinch the finger forcibly, being again relaxed under the direction to " bear down."

It is these muscular fibres which impress the palpating finger as being a horizontal band from a third to a half inch in breadth lying behind the vagina, which are the true and sole supporters of the vaginal outlet, exercising the functions usually attributed to a " perineal wedge." They do not, however, pass directly behind the vagina, but, as shown in Fig. 223, LA, LA, taken from Henle, representing a cross-section a little higher up, embrace the rectum also, with which they are intimately connected, and by powerfully elevating it under the pubic arch thus indirectly embrace the vagina and close the outlet.

These fibres depend like strong arms from the inner surfaces of the pubic rami on either side, and unite like clasping hands behind the rectum, hugging in their embrace both rectum and vagina, and in their intact condition feel through the vagina as if crossing its posterior wall

almost horizontally. This method of the closure of the outlet is more diagrammatically represented in Fig. 224, where the arched line is the pubic arch, beneath which lie the urethra, vagina, and rectum surrounded and held up by the loop of levator fibres springing on either side from the pubic rami.

Fig. 223.
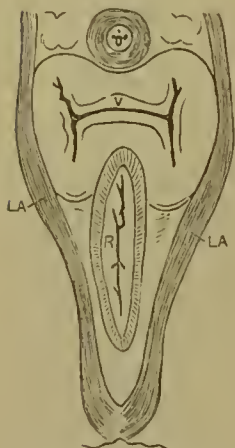
Cross-section near Vaginal Outlet.

Stress is laid upon the normally transverse position of these fibres governing the outlet, as we shall see farther on that the diagnosis of injury to the true supporting structures of the

Fig. 224.

Diagram of Vaginal Outlet, showing relations of levator, rectum, and vagina.

outlet is made by determining whether the direction of the fibres is transverse, vertical, or at an angle between the two, and that in prolapsus and relaxation of the outlet their direction is no longer nearly horizontal, but inclined or even vertical.

Rupture or separation of these fibres from their lateral attachments to the rectum and to one another posteriorly creates the lax open outlet through which the superincumbent structures roll out. So long as these fibres retain their normal connections and functional activity no prolapsus can occur. In pregnancy this tight sling of fibres is softened, in common with the other parts of the parturient canal, by the excess of blood and serum supplied during the months of gestation.

When the fœtal head impinges upon this outlet in normal parturition the first expulsive efforts drive the fibres down, then rotate them outward and forward from under the pubic arch, and finally, by impact following impact, they are gradually stretched and dilated until the head slips safely over without injuring the mother.

The result is far different if the head is unusually large or the chest broad, or if the head descends upon the outlet in a direction which does not allow the exercise of the gradual wedge-like action of the occipital extremity, or when it is driven suddenly through an unprepared outlet by abnormally strong expulsive pains, or, what is the same thing, is brought suddenly down and dragged through by the forceps. The relation of the fibres displaced to the advancing head is shown in Fig. 225, where they have been forced down and rotated outward from under the pubic arch, but, failing to yield in a vertical direction, finally extensive rupture took place.

Injuries arising from parturition are of two kinds—the visible tears, solutions of continuity in the tissues, manifest on inspection; and the invisible, concealed, or subcutaneous ruptures, when the laceration is

FIG. 225.
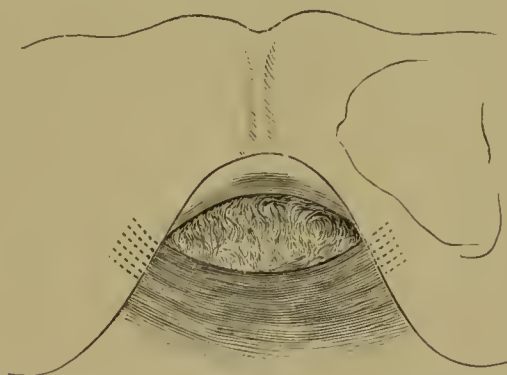
Outlet during Parturition, primipara; head at outlet. Levator fibres are *rotated outward* and *stretched*, but have not yet yielded in *vertical* direction.

submucous or muscular fibres and fasciæ have been over-stretched, subjected to minute lacerations in the fibrillæ, resulting in relaxation of the outlet. Injuries of the latter class, associated with or without, are of the greatest importance. It will be shown farther on that injuries of the latter class are a generally unrecognized but far more frequent source of distress than any other injury received in childbirth.

Character of the Injury produced by Childbirth.—The extent of the lesion produced varies from a simple superficial rent involving only the mucous membrane, so slight in extent and of such frequent occurrence as to be considered the natural product of normal labor, to a tear in the tissue involving the whole thickness of the recto-vaginal septum and extending far up toward the cervix, and leaving the patient with a cloaca or common genital and fecal outlet. Slight tears occur anywhere in the vaginal canal, being found above, at, or below the outlet. They are, however, most frequently observed at the fourchette, involving little more than the delicate fold at the posterior commissure. From this the tear may extend up to the outlet and down to the sphincter, and still remain superficial in character. A tear of another character often begins at the apex of the posterior columna rugarum [c], and extends a variable distance up one or both vaginal sulci, leaving the columna hanging as a loose tongue to contract and form a characteristic feature, a telltale of the nature of the original injury. This form of tear usually extends deeper into one sulcus than the other, and is at times continued up the vagina almost to the cervix. This is truly an inside tear, and is most frequently observed when there has been no instrumental interference to terminate labor, beginning at a point just in advance of the columna, within the vagina, and

not at the fourchette, the external perineum being involved, if at all,
by the continuation of the tear started within at the outlet in both
directions.   Tears of this character have their greatest length in the
axis of the vagina, in their depth reaching down on either side of the
rectum as it lies behind the vagina, tearing it away from its connections
with the levator ani, and following the natural law of extension in the
direction of least resistance.   The rectum is never included in an
injury of this character.   Complete rupture of the perineum is pro-
duced by a tear extending first through the fourchette, then down
through the skin perineum, the external sphincter, and up the rectum.
Fig. 225 shows the normal relations of the three canals held firmly
up under the pubic arch by the loop of the levator fibres guarding the
outlet.   The same is represented diagrammatically in Fig. 226, A,

Fig. 226.
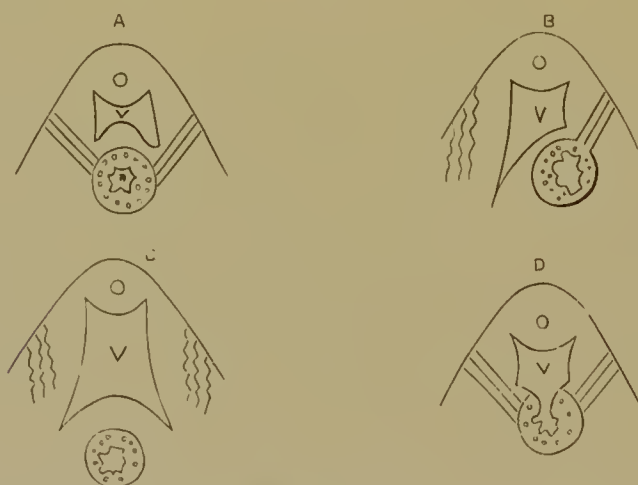
A, relations of levator, rectum, and vagina, diagrammatic. B, same, showing deep tear sepa-
    rating levator fibres from rectum in right sulcus. C, same, showing relaxation of outlet,
    separation in both sides. D, showing tear into rectum; levator fibres not injured.

where the fibres are represented as directly attached to the rectum—a
substitution which is an equivalent, as far as the control of the vaginal
outlet is concerned, to facilitate the study of the effects of injuries upon
the vaginal portion of the canal.

Fig. 226, B, represents a case in which the head has ploughed its
way down the right vaginal sulcus, severing the attachments of these
fibres on that side, but leaving the connections between rectum and
levator on the left side undisturbed.   In such a case the action of the
uninjured fibres will sometimes so displace the rectum toward the
sound side as to make the tear appear to be median.

Fig. 226, C, shows a rupture of the fibres on both sides and a dropping
back of the rectal tube, leaving a great lax outlet without any support
or supporting power.   In Fig. 226, D, a complete tear is shown passing

up the rectum without disturbing the levator fibres on the sides, which explains at once the reason why prolapsus is so seldom associated with sphincter tears. The tear follows the simple law of extension in the direction of least resistance, and as less resistance is offered in the severance of the weaker connections between rectum and levator ani than in the additional task of breaking into the strong muscular rectal tube, the tear, beginning within the vagina, follows the direction of the sulci ; and the inside tear is for this reason always either right or left lateral or both, and never purely median. When the tear is median it involves the fourchette and subjacent tissue, and extends over skin perineum, thus continuing up into the rectum, which, once opened in this way, now offers less resistance than the leaving it to open up a new track by its side. (See Fig. 226, D.) The importance of discovering the tear lying wholly within the vagina is very great, as here lie, as we have shown, the strong fibres controlling the outlet, so concealed in ordinary postures that injuries are almost always overlooked. Full view of the injury is at once attained with a good direct light, wide separation of the labia, and elevation of the anterior vaginal wall by means of a duckbill speculum. When all adhering clots have been removed an irregular, jagged, dark-red surface is exposed, and the transverse muscular fibres are often recognizable on the lateral wall of the torn surface.

FIG. 227.

Superficial External Tear; sutures in position.

Superficial External Tear.—While the internal tear just described, lying in the axis of the vagina, is long, sometimes shallow, sometimes deep, always readily concealed by its position and the collapsing vaginal walls, the tear external to this, to which the attention of the profession has been constantly directed, involves the triangular area of tissue having its apex at the fourchette and its base on a line drawn from sphincter ani to the columna at the outlet (Fig. 227). The tissues included in this wedge have no relation to the support of the pelvic floor, forming but a part of the drapery of the vulvar orifice, serving to keep the labia from gaping posteriorly, and the sacrifice of this area of tissue alone involves no other inconvenience than a rare sexual disturbance consequent upon the sensitive scar-tissue which is sometimes formed. The extent of an injury of this kind is seen in Fig.

227 and in Fig. 228, an old tear, drawn from nature, the parts torn being included within the dotted quadrangular figure.

The small bag-like projection from the anterior vaginal wall, seen in Fig. 229, which forms such a characteristic feature in many of these

FIG. 228.
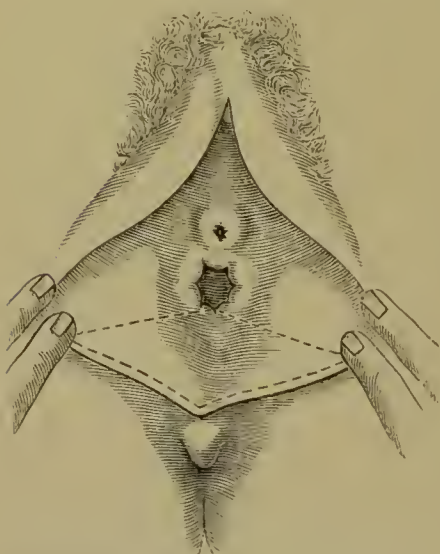
Old Superficial External Tear: scarified area within dotted lines.

FIG. 229.
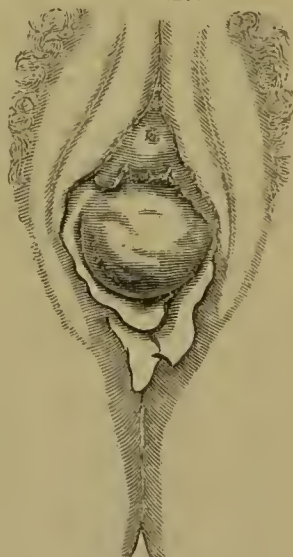
Urethrocele.

cases, hanging underneath the pubic arch out of the vulvar orifice, is not the result of this small tear, but a production of the same original cause, being a downward displacement and rotation outward of a part of the anterior vaginal wall, having peculiar subpubic attachments. Repair of the injury below therefore gives no support to this prolapsing tissue above.

The recent tear involving the whole of this triangle is evident to the most superficial examination after delivery, and in the dilated overstretched condition of the tissues just after the injury often appears a more serious accident than shown to be by the after-history of the case. Upon separating the labia minora the lower end of each is seen to terminate in a ragged red triangular area, with its apex at the lower extremity of the nymphæ, the triangle of either side meeting with that of the opposite side in a sulcus extending up to the vaginal introitus as far as the columna. The torn surface is at times marked by irregular long-projecting teats of tissue.

Complete Rupture of the Perineum.—The complete tear through the perineum extending into the recto-vaginal septum is the result of difficult natural or instrumental labor, when the tear begins by the forceps dilatation of the outlet in advance of the head, brought down upon an unprepared perineum, which is dry and unyielding, starting at the

fourchette, continues through the skin perineum in the median line, through the sphincter into the rectum, and up the recto-vaginal septum for a variable distance. This tear is symmetrical up to the columna, exposing on each side a broad raw triangle, with its margins on vaginal, rectal, and skin surfaces. When this injury merely extends through the sphincter and does not pass up the septum, it is prone to escape notice and be mistaken for an ordinary perineal tear. The unfailing sign is the retracted pitted ends of the sphincter lying on either side of the lower angle of the wound. If it goes beyond the outlet, this tear almost invariably extends into sulci dissecting up the columna, leaving it as a projecting teat or tongue, with a deep furrow on one or other side of it. Very rarely the rupture splits the columna and extends on up in the median line.

Perforation of the Perineum.—Among the very rare injuries to which the pelvic floor is liable in confinement is perforation. The causes of this accident are the same as those operating in laceration in cases of unaided delivery, with faulty position of the head and deformity of the pelvis, or unusual expulsive pains when the head has reached the floor, preventing its proper presentation at the outlet. When the head has descended, instead of being directed gradually forward by the successive pains, the posterior part of the floor is distended, and so thinned out that under a sudden violent expulsive effort the perineum splits in a stellate direction on its skin surface, and the child is driven through without injury to the rectum posteriorly or the fourchette in front. Central rupture may even take place, and by the sudden relaxation produced by the yielding of the tissues the head at once change its direction, and the child pass out *per vias naturales*, the bridle at the fourchette being torn on the child's shoulder as it emerges, leaving an appearance like a simple badly-torn perineum.

Fig. 230.
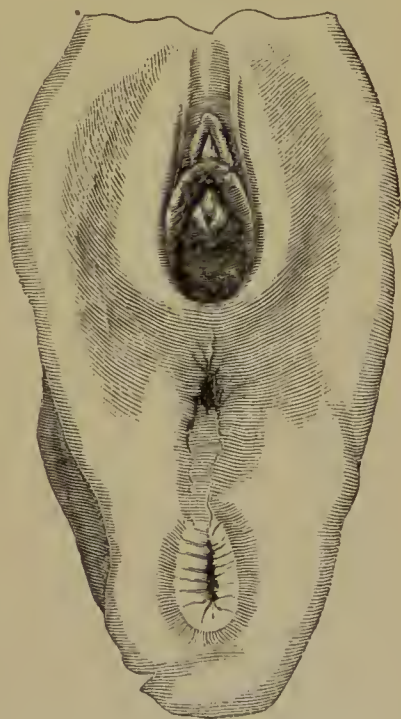
Central Rupture of the Perineum (Hart and Barbour).

The mechanism of this injury can be better appreciated when we bear in mind that the inclined plane of the pelvic floor is formed of several series of muscles, and that a tear may begin in the fibres well back of the outlet, and, the plane being thus broken into, the head may

continue to pass in the same direction, perforating the floor. The accompanying figure (230) illustrates injury of this sort, and is taken from the specimen preserved in the Edinburgh Museum described by Sir J. Y. Simpson. The injury had been received a year before the death of the patient from phthisis, and, although no attempt had been made to repair it, the large fistule through which the child had passed had contracted down to the size of a goosequill.[1]

Relaxation or Over-stretching of the Vaginal Outlet.

Aside from the injuries to the perineum and pelvic floor above described, solutions in the continuity of the mucous membrane and the skin perineum extending a variable depth into the subjacent tissues, and visible upon inspection, there is yet a class of injuries standing by themselves in their anatomical peculiarities and their symptomatology which may be defined as "relaxations."

Relaxation of the pelvic floor and outlet (*vide* Fig. 226, c) is the result of submucous lacerations or over-stretching of the deep fibres which sustain the floor and guard the outlet, associated with or without visible injury. Relaxation is produced either by the presenting part ploughing a deep furrow in the muscular fibres traversing the floor, and leaving a broad gap in which the fingers can be buried, or by a succession of pregnancies, after which the fibres at the outlet fail to contract efficiently, hang uselessly at the sides, and a relaxed outlet is the result, as seen in Fig. 231, where the relaxed and normal outlets are compared. Relaxation is often associated with tear at another point : thus in forceps delivery the head is frequently dragged down, and the outlet rapidly over-stretched to such an extent that it may never regain its normal tone, the visible injury sustained being but a slight rupture at the fourchette.

Diagnosis.—Owing to the laxity of all the soft parts after labor simple relaxation is manifestly recognized with difficulty. It is usually after the patient has been on her feet for some weeks or months that she first seeks advice for the distress and bearing-down pains in the lower part of the abdomen. A careful inspection now shows that the anal cleft, as pointed out by Schatz, is no longer a sharp, deep furrow, but is flat and shallow, and the anus, in place of being drawn up under the pubic arch, lies flat, exposed, and dropped back. The perineum is actually deeper than normal ; instead of being of from two to three centimeters in depth, it is often four or five. On passing the finger within the outlet it no longer feels the powerful ridge of transverse fibres closing the outlet, but finds them instead hanging at an angle or even vertically at the sides, as shown in Fig. 226, c, and the nearest

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[1] Hart and Barbour: *Gynecology*, 2d ed., p. 519.

complete sling of muscular fibres embracing rectum and vagina is a large open loop extending obliquely back into the pelvis, arising low down on either pubic ramus, and swinging around sometimes just in front of the coccyx. The difference in the direction and plane of these controlling fibres in the healthy and relaxed condition is altogether characteristic, and always afterward readily recognized when once discovered.

The efficiency of a perineum not torn on its skin surface is inversely proportional to its depth. (See Fig. 231.) The very deep perineums are weak: the shallow short ones are strong.

Fig. 231.
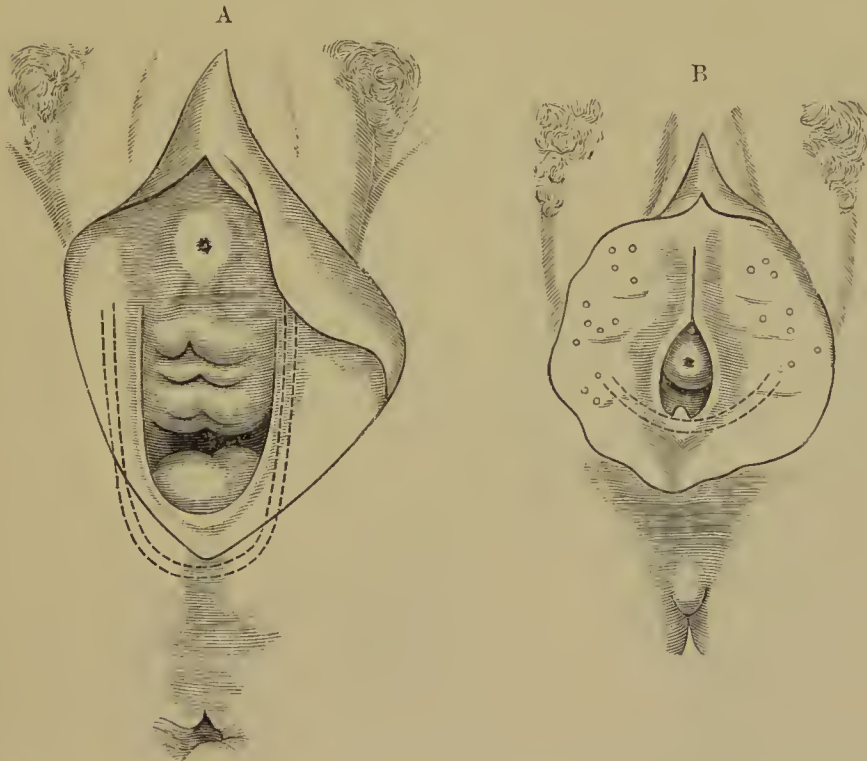
Relaxed (A) and Normal (B) Outlet compared, showing greater depth of relaxed outlet, surrounding which is a great loop of lax fibres, shown in dotted lines; also the shorter measurements of the normal outlet.

The SYMPTOMS attending this form of injury begin when the patient rises from bed. She then for the first time begins to feel discomforts attributable to relaxation, such as weight about the hips, pain in the back, lassitude, and inability to work, especially to do sweeping, washing, or scrubbing, without aggravating the pains and causing a distressing sensation of dragging from either ovarian region obliquely down into the pelvis toward the outlet. Others will often complain of a miserable feeling, as if everything were dropping out—symptoms all

of which are due to a want of proper support at the dependent outlet of the pelvis.

Nature's repair is often efficient in simple tears in restoring function, but in relaxation is inadequate, confining itself to the substitution at the outlet of loops of fibres of large calibre brought down from a higher plane of the levator. The constant spasmodic effort of these loops of larger radius may do much to prevent prolapse, but it is at the sacrifice of nerve-force and discomfort to the individual feeling the constant strain. Thus many outlets which appear on the gynecologist's table as functionally sound, refusing to respond to the ordinary tests described below, will, to the operator's great surprise, after etherization and complete relaxation appear weak and useless and relaxed. The perineum then falls back and the anterior and posterior vaginal walls roll out. In Fig. 231, A, is shown one of these relaxed outlets. Such a perineum would be usually estimated at a glance as uncommonly deep, strong, and sound, and pronounced perfect without further examination. But it is this very appearance in itself which is *primâ facie* evi-

Fig. 232.   Fig. 233.
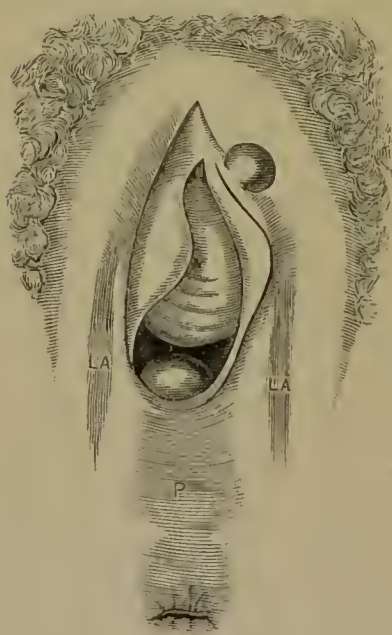
Relaxation of Perineum of Multiparous   Test showing Functional Inactivity of Perineum,
Woman.   shown in Fig. 232.
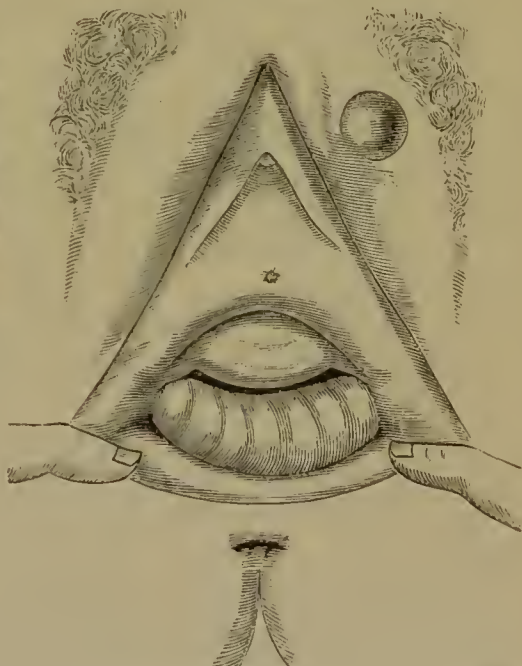
dence of relaxation and inactivity, and the digital examination made as described, by passing the finger just within the outlet and feeling for the supporting fibres, reveals them hanging vertically at the sides, as represented by the dotted lines. Before this woman had borne any children the anus occupied the position in Fig. 231, B, in a deep cleft,

and the depth of the perineum was, as shown, about half the present depth on the skin surface. Fig. 232 shows also a typical relaxed outlet drawn from nature; the flat cleft and the suspiciously deep skin perineum are distinctly shown.

In Fig. 233 is shown the best test for relaxation by burying each thumb or index finger into the perineum on either side of the fourchette, which is frequently intact; the fingers are then pushed downward, outward, and backward, as if the intention were to carry them under the pubic rami, when the outlet will open at once and the vaginal wall roll out in the characteristic manner shown.

In Fig. 234 another picture peculiar to these cases is shown, where the deep relaxed, over-stretched perineum, upon simply drawing the

FIG. 234.
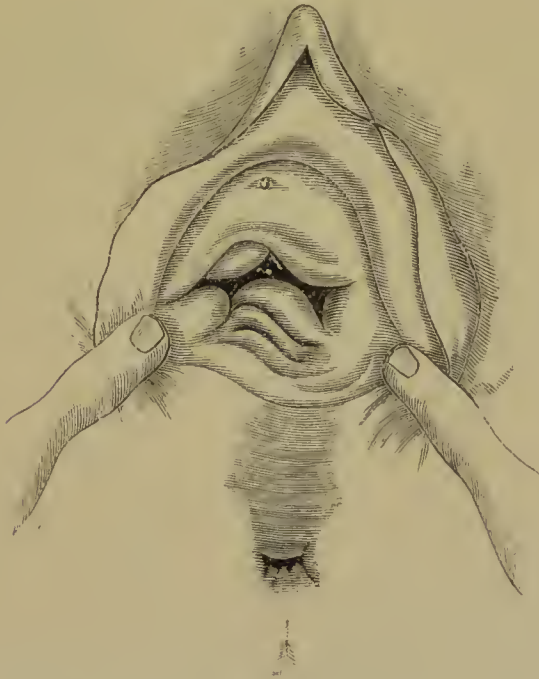
Test for Relaxation, showing eversion of anterior, posterior, and lateral walls of the vagina.

sides of the outlet apart, results in the rolling out of the anterior, posterior, and lateral walls of the vagina.

In the erect and in the dorsal positions the pressure within the abdomen tends to force the pelvic structures out of the weak outlet; consequently the outlet is always filled with prolapsing structures, and the actual gap in the support is often incorrectly estimated on account of this simple deception.

If we now place the patient with a relaxed outlet in a lateral semiprone posture, the conditions are reversed by the suction in the opposite

direction, and instead of the parts falling together from simple relaxation and want of support, they now drop apart to an extent in direct relation to the degree of relaxation and the negative pressure created here by posture. The effect of such a posture upon a case of relaxed outlet is seen in Fig. 235, which is in marked contrast to the tightly-

FIG. 235.
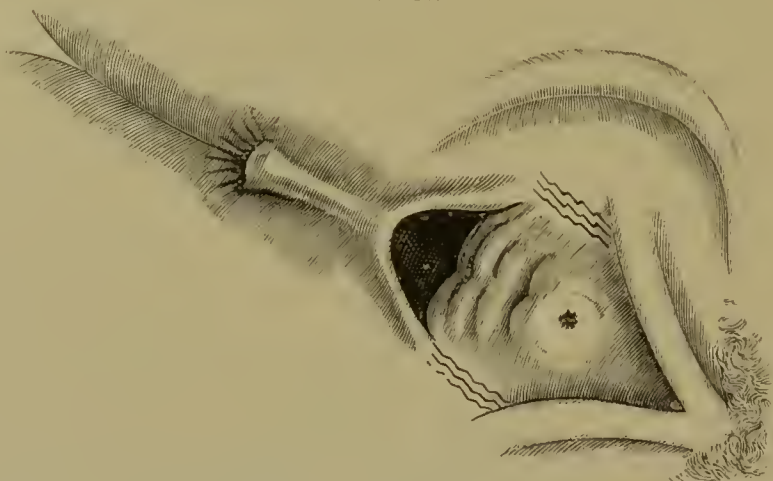
Test for Relaxation in lateral semi-prone posture.

closed sound outlet under the same conditions seen in Fig. 236. The loose inactive fibres are represented by the dotted lines hanging vertically at the sides, and the large opening looks directly up to the cervix

FIG. 236.
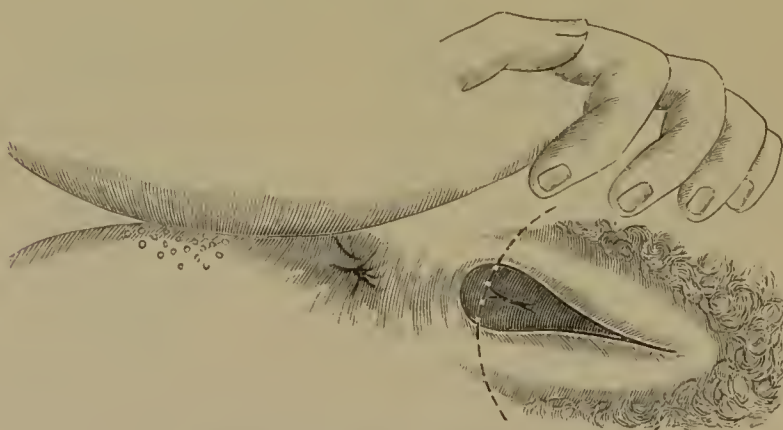
Normal Outlet in lateral semi-prone posture.

uteri, while Fig. 236 shows the firm band holding up the normal intact outlet, preventing any opening of the canal by simple posture.

Nature's method of repairing lacerations is often very efficient, and always a remarkable exhibition of her conservative powers. In

case of overstretching of the fibres supporting the vaginal outlet just referred to, the natural method is twofold : in the first place, when the strong band closing the outlet is broken down, the levator fibres next beyond are called into play, and the outlet thus more or less completely closed; these fibres, brought down from a higher plane, surround the outlet in a loop of much wider radius, and when the patient is not at perfect rest constantly endeavor to close the outlet by spasmodic effort, thus with some efficiency replacing the natural support. In cases of visible tear at the outlet, through the fourchette, or down through the sphincter, nature adopts other methods. Primary union of the torn tissues is effected when with suitable apposition of the opposite sides, with rest and absence of irritating discharges, complete reunion occurs within a few days. This method of cure without operation, so desirable and so confidently expected in many cases, is much rarer than is generally believed, and even with the most careful attention to secure all the favoring conditions usually fails. The common mistake in this matter depends upon the fact that some amount of primary union almost always occurs at the bottom of the wound, and the subsequent cicatrization of the remaining area finally leaves behind nothing but a delicate scar easily escaping notice. The only sure way to secure primary union is by the immediate operation.

In the inflammatory processes, granulation, and formation of scar-tissue at the seat of the tear, nature finds a substitute often very efficient for the original intact condition. Within a few days after the reception of the injury the torn parts begin to be active in throwing off the contused and necrosed shreds of tissue, in the formation of granulations, and finally forming broad lines of pink scar-tissue, which in time contract into fine firm white linear cicatrices.

The cicatrix thus naturally formed often effects what is so repeatedly attempted by operations—the substitution of the support of a plug of firm cicatricial tissue at the vaginal outlet, giving a new unyielding point of attachment to the torn muscular fibres, thus bridging the gap and restoring the lost support. This is the commonest form of repair, and is the efficient support in the great number of badly-torn cases which come to the gynecologist for other ailments, in which he reads the history of the past in the extensive cicatrices extending far up into the vagina, but finds a well-closed outlet.

In complete tear extending through the sphincter, nature is also able to do much to remedy the injury, in spite of the assertions of the authors to the contrary. When the tear simply extends through the sphincter muscle, the cicatrization which follows may bind the sphincter ends together, preventing more than slight separation, as shown in Fig. 237, B, and thus, although the ring is incomplete, by continuous strain, as in the case of the levator in relaxation, spoken of above, a

fair control of the bowels is established, and the individual may retain perfect control of the evacuations.

In tears extending farther up the septum the activity of the sphincter, no longer working concentrically, tends to contract to a point within the rent (Fig. 237, c), pulling out the ends and straightening the
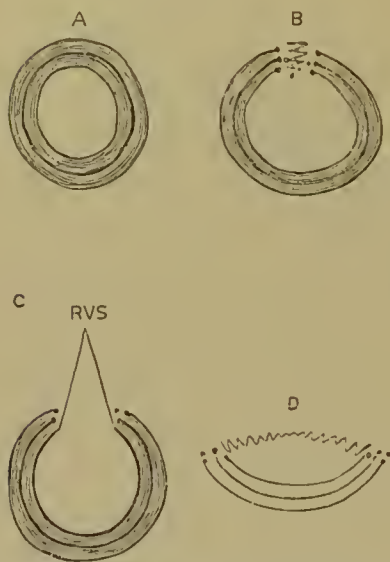
FIG. 237.   FIG. 238.
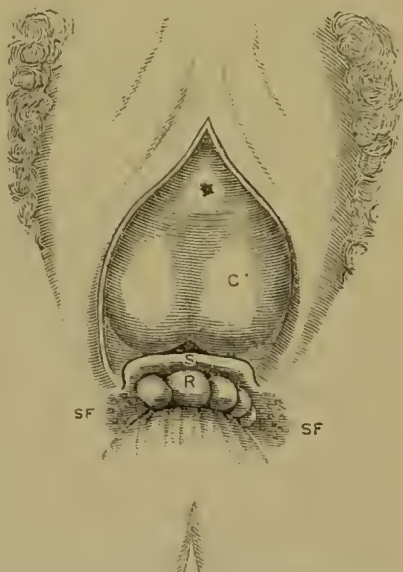
FIG. 237.—Sphincter Ani, intact in A, showing the result of a rupture simply extending through the sphincter in B, and a deep tear into the septum in C, and its results in D.

FIG. 238.—Complete Tear through the Sphincter and far up the Recto-vaginal Septum, which has been drawn down to a sharp, transverse ridge (S) across the anal outlet. Beneath this pouts the dark-red mucosa of the rectum, R, on either side of which are the pits SF, showing the position of the sphincter fibres.

muscle, as shown in Fig. 237, D, and Fig. 238, SF, forming the little pit on either side with its many little characteristic depressions. From beneath this ridge the red mucous lining of the rectum pouts, and above it lies a broad triangular glazed surface representing the tear on the lateral surface, as shown in Fig. 238.

OPERATIVE TREATMENT OF INJURIES OF PELVIC FLOOR AND PERINEUM.

Operative procedures for injuries of the perineum and pelvic floor are designed to restore the integrity and the functional activity of the parts, and are classified, according as the operation is performed immediately after delivery, at an interval of two weeks or three weeks, during the granulation process, or after complete cicatrization, as primary, intermediate, and secondary operations. The general principles underlying all operations are the same; they are, antiseptic cleanliness throughout, perfect denudation, accurate approximation of the denuded

surfaces by suture, and rest of the parts until firm union has been secured.

The recent, primary, or immediate operation, performed immediately after delivery or on the day following, is to be preferred under all circumstances. Its advantages are manifold; the denudation is already made, and the parts can be approximated without sacrificing the strips of tissue cut away in the secondary operation; the numbness of the parts is almost always sufficient to allow the sutures to be passed without an anæsthetic; the patient is saved the discomfort of the slow process of granulation or cicatrization; and she is spared the suffering and changes which begin and continue to advance with the neglect of the primary operation until she is relieved by the secondary operation. Unless the parts have been greatly contused during labor immediate union can always be secured. The dangers of sepsis are not increased, but rather diminished, as the septic process usually starts at a point higher up in the genital canal, and the proper closure of the tear shuts this lower area off from the possibility of contamination.

The *technique* of the recent operation is simple. The only instruments needed are an elevator for the anterior vaginal wall, a pair of scissors, a needle, a needle-holder, and silk, silkworm gut, or silver wire for suture material. It must be constantly borne in mind that the success of all perineal work depends upon the three factors, perfect

Fig. 239.
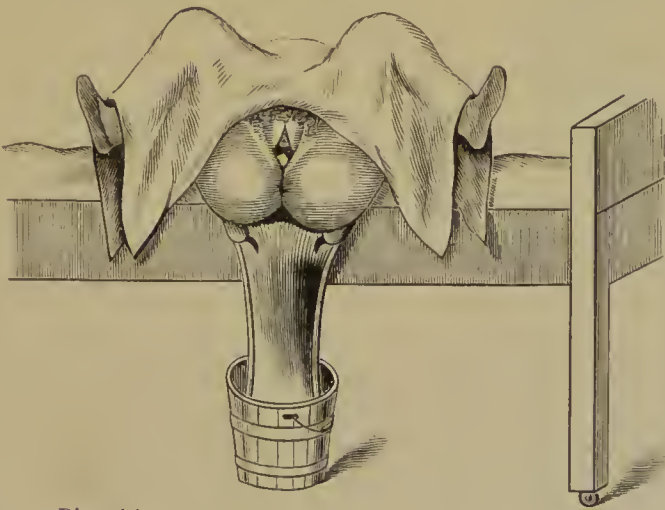
Disposition of Patient on the Bed for the recent operation.

denudation, perfect cleanliness, and perfect approximation throughout. The operator must first endeavor so to dispose the body of the patient that he may work with comfort and assurance of success; therefore the operation must never be undertaken with the patient lying awkwardly in the bed and with insufficient light upon the parts. If it is deemed

necessary that the tear should be repaired, every other consideration should yield at once, and the operator proceed to secure such disposition of the patient as will give him perfect control of the field. With this end in view, the patient should be brought to the edge of the bed, with the thighs well flexed on the abdomen, and suitably protected by a sheet covering body and thighs, as shown in Fig. 239, and the perineal pad (Fig. 240) under the hips, catching all fluids and conveying them into the bucket below. The operator then seats himself, with a good light falling over his shoulders upon the parts, and proceeds to

Fig. 240.
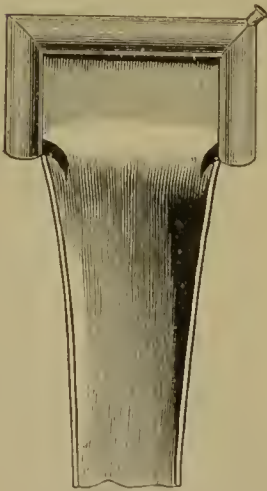
Fig. 241.

Perineal Pad.
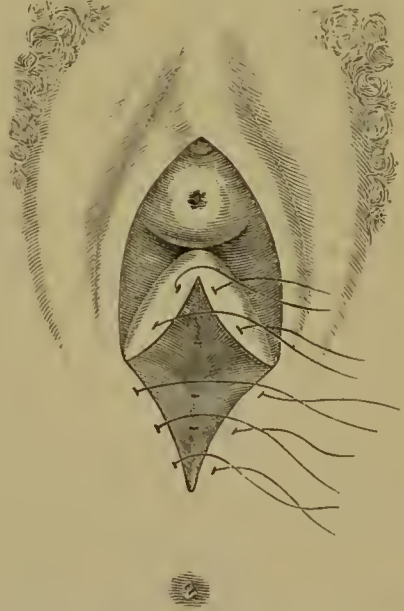
Recent Tear involving external triangle, requiring internal as well as external sutures.

close the wound. Denudation in the recent tear is already made, but it may often be improved by cutting off ragged masses and projecting teats of tissue. To prevent blood from flowing down from the uterus and obscuring the field of operation, a sponge or piece of gauze must be pushed up into the vagina. Frequent irrigation greatly facilitates the rapidity of the work and adds to the comfort of the operator, preventing the blood from coagulating in the tissues by continually cleansing them, and at the same time constantly washing instruments and fingers.

Superficial Recent Tear.—When the tear is confined to the superficial triangle from the fourchette to the sphincter below and the columna above as seen in Fig. 227, it may be repaired by a few external sutures, as shown in the diagram. When, however, the tear extends farther up into the vagina, it cannot be accurately approximated in this way, and

sutures must be passed, as shown in Fig. 241, which when brought up and secured leave the parts in the condition shown in Fig. 242, the anterior wall of the vagina being raised by a retractor to show the two inside and three outside sutures. These sutures are entered on one side a quarter of an inch from the margin, carried down to the bottom of the wound, appear there, re-enter, and reappear at the corresponding point on the opposite vaginal surface. They may cross each other, as shown in Fig. 250, on cross-section, where c represents columna, and A anus, with sphincter fibres above and below, and the sutures s s s are seen in cross-section, tied on skin and vaginal surfaces. The proper introduction of the sutures requires some knack and judgment. The threaded needle is caught by the holder at right angles or directed slightly away from the operator. A curved needle is entered on the vaginal surface at the upper angle of the tear, and with a sweep of the wrist carried under the tear and brought out on the other side at the same distance from the margin. This first and uppermost suture is important, as when properly introduced it prevents the for-

FIG. 242.

Recent Inside Tear, and repair by sutures.

mation of a pocket in which the discharges accumulate and often defeat an operation otherwise well planned. From this point down the sutures should be passed at least four to the inch. As suture material, silk, silkworm gut, or silver wire may be used. My own preference is strongly in favor of silkworm gut which has been preserved for some weeks in a 5 per cent. solution of carbolic acid in water. Any unevenness or pouting of the lips after the sutures have been brought together must be remedied by superficial sutures. When the sutures have all been passed they should then be tied, beginning with the uppermost and proceeding downward. The parts thus united are next dried off and dusted with a powder of boracic acid and iodoform, and the patient returned to her place in the bed. The urine should only be drawn so long as the patient is unable to pass it. Unless the lochia are fetid no other attention need be given the wound until the sutures are removed, from the seventh to the ninth day. Should the lochia be irritating or fetid, daily vaginal injections of a $2\frac{1}{2}$ to a 3 per cent. solution of carbolic acid in water must be given, taking care to pass the nozzle of the syringe carefully, so as not to injure the field of operation.

Recent Internal Tear.—Where the recent tear involves the tissues lying within the fourchette and around the columna, it invariably passes up one or both fornices, leaving the columna projecting as a teat in the middle, as seen in Fig. 243.

A tear of this kind demands treatment differing widely from that last described. The extent of this injury is only seen on separating the

Fig. 243.
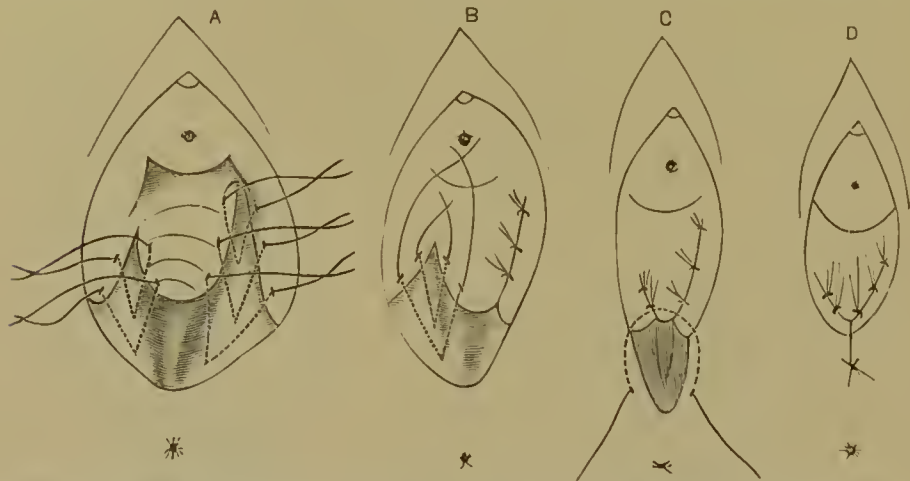
Recent Tear inside Vagina, and Suturing: A, sutures all passed; B, drawn up on left side; C, drawn up on both sides and crown suture in place; D, all sutures tightened.

labia and elevating the anterior vaginal wall with a retractor. It is here that rupture often occurs, extending around the columna and associated with tear or overstretching of fibres below the field of observation, and followed by relaxation of the outlet. The importance, therefore, of securing immediate union is very great. With suitable exposure, while an assistant holds the retractor raising the lax anterior wall, the operator proceeds to pass the upper stitch, closing the wound at its upper angle. The sutures below this must then be passed with the two distinct objects in view of grasping the torn muscular tissue on

Fig. 244.
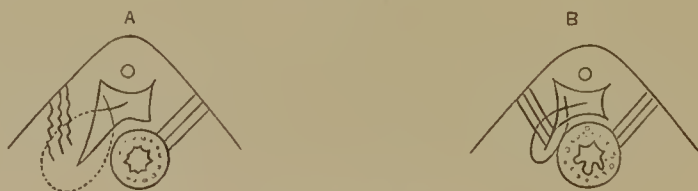
Object attained by suturing shown in Fig. 243.

the lateral wall by deep suturing, as shown in Fig. 244, and of exercising a definite lift, each suture helping to lift up the pelvic floor.

By the very mechanism of the distension of the pelvic floor during parturition the central part suffers the greatest displacement, and when

torn loose from its muscular attachments on the lateral walls remains sagging below the parts on the sides which are connected with the unyielding pubic rami. Thus a simple transverse suture will unite structures not naturally opposed. This can best be remedied in the immediate operation by a peculiar suture devised by Dr. Emmet, which is carried out by entering the needle on one side of the tear and carrying it from above downward toward the operator, as shown in Fig. 245, bringing it out at the bottom of the tear, re-entering it, and carrying it up on the other side of the tear. The figure shows the same needle entering and appearing at the bottom of the sulcus, and re-entering and appearing above on the opposite vaginal surface. This suturing must be done on each side of the columna, as shown in Fig. 243, if the tear extends up both sulci.

Fig. 243, A, shows the triangular tear as it extends up each side of the columna [c], and the sutures all introduced in the manner described and ready to be drawn up; the next figure shows the change produced

Fig. 245.　　　　　　　　　　Fig. 246.
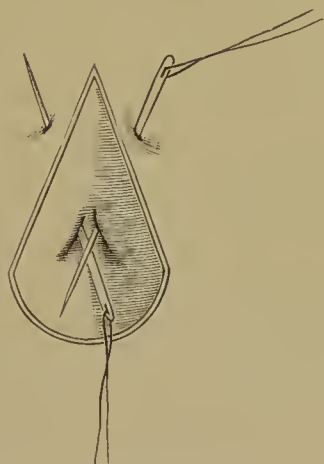
Downward and upward direction in which the needle is passed to lift up the floor of the tear.

Bad result of only passing external sutures.

by tying a single set of these sutures on the left side; while in the following figure is seen how completely the large area of displaced ruptured tissue is carried up into place and disposed of by this method of suturing, leaving but a small boat-shaped area externally, which is closed by a suture, shown in the third figure, entering well back at the lower angle of the tear, brought out in the vagina on its lateral surface near the apex of the columna, then, transfixing the end of the columna, re-entering on the lateral wall of the opposite side, emerging finally on the skin perineum opposite the starting-point, thus carried completely around the exposed area, and acting when drawn up like a purse-string, as seen in Fig. 243, D, which shows the final effect.

The effect of pursuing the common method of simply closing the tear externally and neglecting the vaginal surface is shown in Fig. 246, where with perfect external closure and an apparently good perineum a large open pocket remains within, to catch discharges and defeat with certainty the attempt to secure primary union beyond the mere skin surface.

This method of suturing is also shown in Fig. 247, where the denuded

FIG. 247.
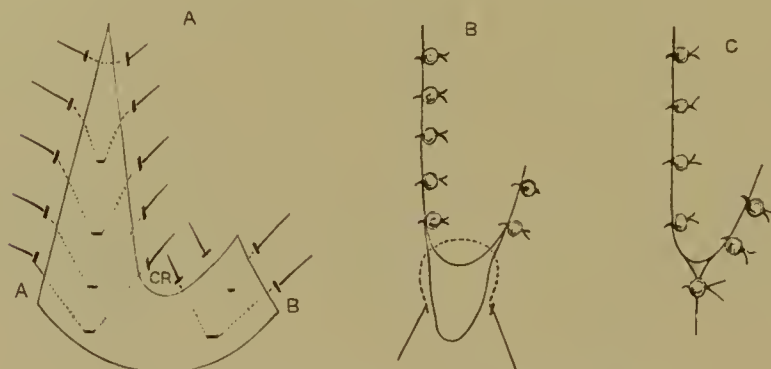
Suture in recent inside tear, shown diagrammatically.

area and the lines of suturing are shown diagrammatically. In A the visible portion of each suture is indicated by making the line heavier, and that part which lies buried in the tissues is represented by the finer line continuous with the heavier. The effect of drawing up and shotting the sutures laid in A is seen in B, where also the crown stitch has been introduced. In C is seen the final effect of drawing up the crown stitch. No special sutures are required to bring together that part of the tear which lies below the sulci and the apex of the columna. The difference in the areas of B and C shows how marvellously the more external part of the tear is disposed of by this method of suturing described, so that in C but a single external suture is needed to bring the whole together.

In Fig. 244, A, is shown the tear in the right sulcus in transverse section, as represented also in Fig. 226, B, showing what is accomplished by the suture grasping the torn muscular fibres at the side and the connective tissue alongside of the rectum on its median aspect; while in Fig. 244, B, is shown the effect of drawing up this suture and bringing the torn structures into apposition. The suture is seen thus to act as a splint lying in the tissues on either side of and parallel to the wound surfaces. For this purpose the silkworm gut is pre-eminently suitable, occasioning far less puckering and gathering of the tissues into a bunch than does silk or any more flexible material.

Recent Complete Tear; Recent Tear through the Sphincter.—The

recent tear extending through the sphincter into the rectum calls for a somewhat modified plan of treatment, necessitating greater care and accuracy in passing the sutures, as a failure anywhere along the line is apt to result in a disability as bad as the original condition. In view of the distressing nature of the symptoms, the discomfort and the disgusting results following this injury, it is of all others the most important, and demands immediate action on the part of the operator. Defeat may arise from several sources: the tissues which have been bruised may slough ; the field is open to contamination from the lochia, as in tears at the outlet; and there is added the increased danger of septic absorption from the communication of the wound with the rectum, and the difficulty of effecting a complete closure when sutures are to be passed in several opposing directions, without preventing union by the very means which are designed to promote it.

Operation.—The great difference between the operation for complete tear and the closure of tears of the superficial external perineum and within the outlet lies in the efficient closure of the rectal rent and in the directions in which the sutures are passed.

The patient must be brought to the edge of the bed as already described (Fig. 239), with thighs well flexed on the abdomen and the perineal pad beneath, and two retractors introduced into the vagina on either side, exposing the wounded surface, facilitating the passing of the sutures. The parts must be thoroughly cleansed and kept clean by frequent douchings with plain water, and a plug laid in the rectum, with a string attached, to prevent evacuations soiling the wound. Bichloride douchings must not be used in rents involving the rectum, as the fluids have a tendency to escape into the rectum, and, being retained, to undergo absorption, which has resulted fatally to the patient.

The sutures may be passed in several ways to secure the chief point of importance, the exact coaptation of the torn surfaces in their natural position, avoiding at the same time strong traction in opposite directions by two sets of sutures. Silk for the superficial, and silkworm gut for the deep sutures, yield the best results. When the tear extends in the vagina up to the columna, the rectal rent must be closed first, and the rectum separated from the wound by the introduction of a number of interrupted sutures about a sixth of an inch apart, as shown in Fig. 248. While the upper angle of the rectal rent is lifted up by a tenaculum, these sutures are entered close to the mucous surface at the margin of the tear, and carried an eighth of an inch into the tissues, brought out and carried across the rent, re-entering and appearing on the rectal surface of the opposite side. These sutures may be tied either as they are introduced or left long until all have been passed, when all are tied, beginning with the uppermost. The rectal rent is thus closed down to the sphincter. Two or three fine sutures may now be passed in like

manner directly through the sphincter ends, or, as usually practised, union of the sphincter may be ensured by introducing a stout suture vertically below and behind its torn extremity, and carrying it completely around the upper angle of the tear if shallow, or bringing it out and entering it on the wounded surface above the row of rectal sutures, as shown in diagram, Fig. 249, C and D. A and B show how imper-

FIG. 248.
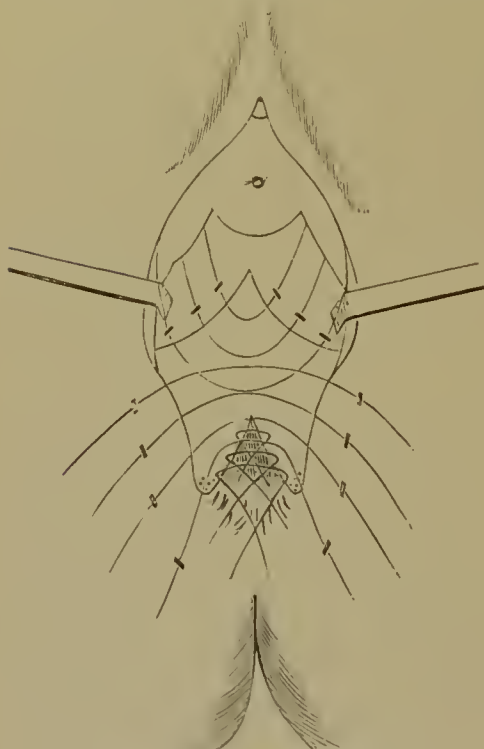
FIG. 249.

Recent Tear through the Sphincter.
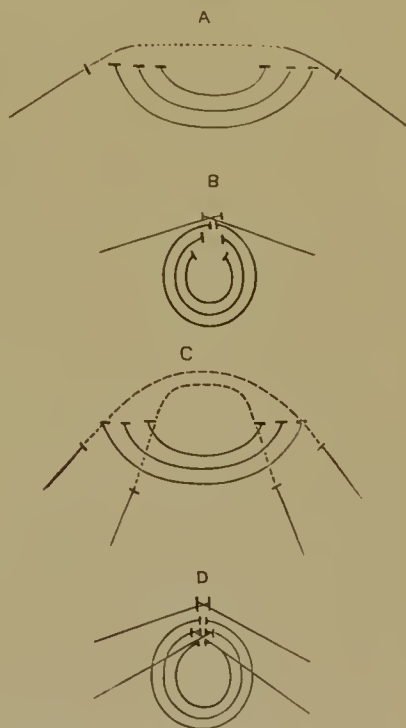
Introduction of Sutures to keep sphincter ends together.

fectly the ends of the sphincter are brought together by a suture introduced on a line with the ends of the sphincter, as shown in A. In C is shown the correct introduction of two sutures, bringing into accurate apposition the sphincter ends, seen in D.

For shallow rectal sutures silk or catgut is best, while silver wire or stout silkworm gut is best to encircle the sphincter ends. These materials will hold without cutting if the tension is distributed over a sufficient number of sutures. Sutures are next entered on the vaginal surface of the wound, beginning at the angle. A number of these should be passed transversely if the tear into the vagina is shallow; finally, the wound is brought together on the skin surface by a suture passed as shown in Fig. 248, as in the ordinary perineal tear, to which condition the wound has been reduced by the closure of the rent in the rectum.

When the rent extends farther up the recto-vaginal septum, into the vagina and into the sulci, the plan of suturing must be modified, as shown in Fig. 248. The sulci must first be closed, as seen in Fig. 250, by sutures passing down to the floor of the rent, beginning in the angles down to the rectal tear, when this should be closed as described and shown in Fig. 250. The skin surface is closed last of all by a series of deep-laid sutures, the uppermost grasping the point of the columna and bringing it down to the skin surface. If silkworm-gut sutures are

used, they may be cut an inch or more in length to facilitate removal, all the more external sutures being left untied until the full number have been passed, when they are brought together one after another, each one being tested as it is drawn up, to make sure that the apposition is perfect, and then closed from below upward to the fourchette. Any pouting or unevenness between the sutures must be carefully disposed of by as many superficial and half-deep sutures as may be necessary to secure the utmost exactitude in the apposition. No special dressings are necessary, the parts simply being kept perfectly clean and douched if required. The bowels may be moved as early as the third or fourth day

Fig. 250.

Complete Tear, extending beyond the columna (C) up into both sulci.

without detriment, the patient taking a laxative, assisted if necessary by a rectal enema of a pint of warm water rendered milky with soap, containing an ounce of inspissated ox-gall. The insertion of the point of the syringe for the purpose of giving an enema should never be trusted to an inexperienced nurse. Operators have been frequently defeated in their best directed efforts by the clumsiness of an attendant actually plunging the point of the syringe between the sutures and forcing the injection into the perineum.

In giving the enema the patient may lie conveniently upon her side with flexed thighs, and the nozzle of the syringe should be introduced, pressing back on the posterior margin of the anus. If the discharges from the vagina become fetid and irritating in character, a vaginal douche of a 2 per cent. solution of carbolic acid in water should be given twice daily, observing the same care about the vaginal sutures, and making pressure with the point of the syringe on the anterior vaginal wall. All the stitches which can be easily reached should be removed from the ninth to the tenth day, while the remaining sutures, if silkworm gut has been used, may be left until the patient rises from bed at the

end of two weeks. The urine should be drawn every four to six hours until the patient is able to void it voluntarily. The sexual relation and any strain, such as is involved in household duties or yielding to the maternal instinct and constantly lifting up the baby, should be prohibited for at least three months, when the firm knitting of the tissues will ensure the permanent success of the operation.

The Intermediate Operation.—The intermediate operation is undertaken at a time varying from ten days to three weeks after labor. It differs widely from that just described, in that in the latter the denudation is already made and the tissues are soft and relaxed, while in the intermediate operation the granulation-tissue must be removed, and there is always present abundant young vascular scar-tissue. The appearance of the parts also differs, as shown in Fig. 251. The walls being rigid, the area of the tear is distinctly mapped out, the lateral walls cupped, and at the lower extremity of the nymphæ, in the place of the fourchette, are two very prominent pyramidal teats of tissue projecting from the lateral wall toward the median line, at the point where the external becomes continuous with the internal laceration.

Freshening.—This operation was especially urged by Duparcque, but has been commonly considered by other operators as the least favorable time for freshening the wound and securing good union by suture, both because of the condition of the patient and the peculiar condition of the tissues. The selection of this time is justified by the distress occasioned by the granulating surfaces and the formation of the cicatrix. The time for operation is between the first and third week following delivery. The whole operation, freshening and suture, may be conducted under the local anæsthetic influence of a 10 per cent. solution of cocaine.

After a satisfactory exposure of the injured surface by bringing the patient to the edge of the bed or placing her on a table, the wound is carefully dried, and a piece of cotton saturated with the cocaine solution is laid flat on the granulating surface, covering the whole area. After five minutes the cotton is removed, and the whole surface rapidly scraped with the blade of a sharp scalpel until all granulations are removed and a raw, fresh, and freely oozing surface is exposed. The area is not so extensive as in the recent tear, owing to the formation of the scar-tissue, and not so contracted as at a later stage. The fresh scar formed on the margin of the wound must be thoroughly broken down and removed by the scraping, which is carried well into sound tissue.

Sutures are passed as shown in figures in diagram 248, introduced closer to the margin of the wound than in the immediate operation, as far as possible entered on the inside. Fig. 251, A, shows the appearance

of the parts with the sutures in place, while in the second the inside sutures are tied, and in the third the operation is completed by tying the last external suture.

Where the tear has been complete and the intermediate operation is undertaken, denudation is made in the same way, and the sutures introduced as described in the immediate operation. The parts must be kept perfectly dry after suturing, or if wet with secretions must be douched daily with an antiseptic solution. The patient should exercise the same care regarding strain and the sexual relation as after the primary or secondary operation. The stitches are to be removed from the eighth to the tenth day, as usual.

Secondary Operation; Operation for Old Tear.—Secondary operation is performed upon the perineum after the formation and contraction of the cicatrix at a period varying from several months to many years after the injury. All granulations have disappeared, and the new vascular, tender cicatrix has contracted to a lineal scar with radiating lines, and in the surrounding tissues all inflammatory disturbances have long subsided. The character of the secondary operation differs according as the original recent injury involved the parts just within the outlet of the vagina, the external triangle of the perineum,

Fig. 251.
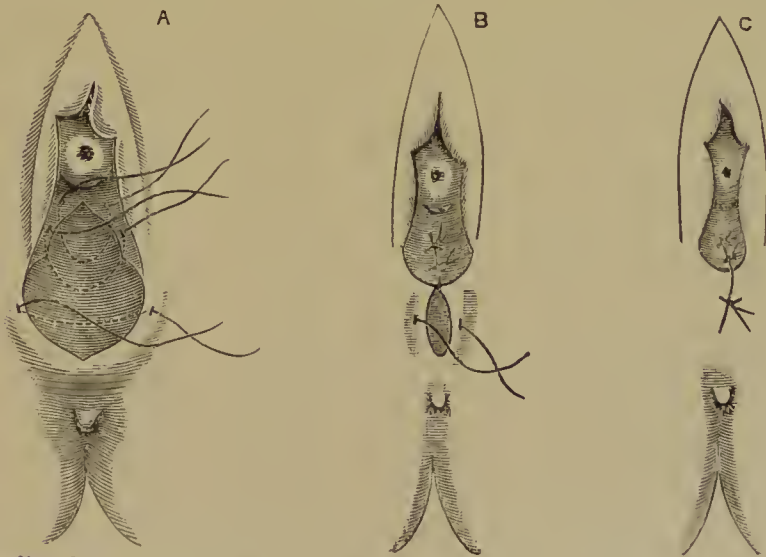
Intermediate Operation and Proper Suturings: A, suturings, two inside, one outside in place; B, inside sutures drawn up; C, all sutures drawn up.

or extended beyond this triangle to include the sphincter and part of the recto-vaginal septum. The scar cannot always be readily found, but a patient search will reveal its presence by pulling the tissues apart, when it appears as a white line making a distinct break in the natural furrows of the tissue which run to this point, end abruptly, and begin.

anew on the other side of it. The increased resistance of the scar-tissue is also easily recognized by the palpating finger.

Where the scar-tissue is confined to the vaginal outlet there are not, as a rule, any associated symptoms unless they are connected with relaxation of the outlet. As has been shown, the formation of the cicatrix is conservative, giving new points of attachment for the muscular fibres supporting the outlet. To allow for the traction and displacement caused by the scar, the denudation should extend freely beyond its borders.

Instruments.—The instruments needed for secondary operations upon the perineum are few and simple. Emmet's right and left scissors curved on the flat are a great convenience, but may readily be dispensed with for a single pair of straight scissors curved on the flat; three tenacula; a pair of dissecting forceps; straight or curved needles; a needle-holder; silk; silkworm gut; an irrigator; perineal cushion; and "beinhalter" or "crutch."

The preparation for the operation involves the care of the patient throughout a short period immediately preceding it, and the arrangements in the operating-room prior to commencing the restoration of the injured parts. Where it is possible to secure every attention and a few days or weeks are not important, a course of daily warm baths, with friction of the skin, massage, and soft diet, careful regulation of the bowels, and two vaginal douches daily, will always be of advantage. In the poorer classes, however, where every day counts, and where the mother cannot remain long away from her family, but one or two days of preparation are absolutely needed. The most important preliminary is the thorough evacuation of the bowels by means of Epsom salts, compound licorice powder, or castor oil, given eighteen hours beforehand, and assisted not less than six hours before operation by an enema of a pint of warm water and soapsuds. The purgative and the injection must not be given too near the time of operation, or the operator will be in constant danger of sudden violent explosion of the liquid contents of the rectum upon his person, seriously disturbing the progress of the work. To prevent this and allay nervousness a suppository containing a grain of the aqueous extract of opium may be given with great advantage an hour before the operation.

Time for Operation.—One or two weeks after the menstrual period is the most convenient time, although the appearance of the menstrual flux within the few days following operation will not interfere with the success of the result.

Anæsthesia.—Ether is to be preferred under the ordinary conditions of administration of anæsthetics prevailing in most hospitals, but it will be necessary to substitute chloroform in renal cases, and occasionally in others not affected by ether, or choking up with râles in the

lungs, or otherwise badly affected by ether. Chloroform usually acts happily in such cases. It has several times happened to the writer that a patient who has been breathing a dense vapor of ether for a quarter of an hour, and opens her eyes to answer a question, has dropped quietly to sleep after a few whiffs of chloroform.

The best method of giving chloroform is through the Junker apparatus, requiring one assistant to give his exclusive attention to its administration, while another keeps his finger continually on the pulse. Chloroform given on a napkin by an assistant only accustomed to the use of ether is exceedingly dangerous. Nervous cases greatly dreading the anæsthetic, or those taking it with bad effect, and cases suffering from phthisis or other chronic disease, may be operated upon under a local anæsthesia produced by careful multiple hypodermic injections of an 8 per cent. solution of cocaine. This method should not be employed by a slow operator, who will spend three-quarters of an hour to an hour on a perineal operation, as the effect of the drug wears off after the first half hour, and it will then be necessary to resort to ether or chloroform.

Fig. 252, representing an area to be denuded on the posterior vaginal wall, shows by a series of small circles the points for injecting the cocaine solution. A hypodermic syringe is filled and pushed quickly in an oblique direction just under the mucous membrane, and about half a minim injected at each puncture at points about a fifth of an inch apart. After waiting three minutes the operator may proceed with impunity, cutting the tissues rapidly away in long broad strips. In this way the little pockets of injected cocaine solution which have already paralyzed the sensory nerves of the part are being continually opened into and let out on the denuded tissues, and thus perpetually bathing the surfaces and keeping up the anæsthetic effect.

Fig. 252.
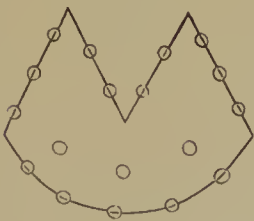
Points for Multiple Hypodermic use of Cocaine.

Fig. 253.
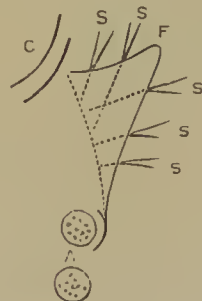
Superficial External Tear; section showing track of sutures, S, S, crossing each other; C, columna; A, anus; F, fourchette.

Cleanliness throughout the operation and during convalescence is one of the chief factors in successful work. It is best secured by thorough cleansing of the whole vaginal, and if necessary uterine, tract

previous to operation, and by equal care during operation to admit no septic matter, and by such efficient closure of the wound as will prevent the subsequent entrance of septic material. The abundant use of pure water fulfils all the indications of perfect cleanliness, and the writer has long since dispensed with any but an occasional use of sponges, operating under a steady flow of water which has been sterilized by boiling, and afterward set aside and decanted before use. The douche apparatus is a glass bottle, with a nozzle below, holding a gallon of water, or, for convenience in carrying to private houses, a soft rubber bag for a reservoir, which is hung three feet above the level of the table. The water is delivered through a rubber tube terminating in a hard point, with a cock controlling the flow. This is set to trickling continuously over the field, guided throughout the operation by an assistant. This use of water does not simply substitute, but has a great advantage over the use of, sponges; the blood is washed away without clotting as soon as it appears on the wound. Instruments remain clean, and, above all, the hands are kept clean and free from the stickiness of fresh blood, in addition to the fact that the field is not constantly obscured by a sponge often manipulated by an awkward assistant. Any quantity of water can be used with impunity if the perineal cushion be placed under the patient's buttocks. This pad, shown in Fig. 240, is rectangular, consisting of an inflatable rim with a floor and an apron of rubber sheeting. In using the pad the patient's clothes are pulled up and the buttocks brought down on the pad over the edge of the table, when any water used runs down upon the floor of the cushion, and, being prevented from escaping on to the table by the rim on three sides, flows over the apron, directed toward its centre by a small flap

Fig. 254.

Method of Using Scissors in Denuding.

attached to the rim and the sheet, when it runs over into the vessel below.

Denudation is best effected by using a tenaculum, as shown in Fig. 254, which is hooked into the tissue to be denuded, and, raising it a little and pulling gently in a direction opposite to that in which it is desired to cut, the scissors are buried to the heel and made to take long sweeping cuts at every closure. The best tenaculum for this purpose is very light, made entirely of metal, and with the point set at right angles to the shaft. The tongue of tissue freed by the first cut must

be held down parallel to the scissor-blades, which are again buried to
the heel, and continue to make sweeping cuts, removing the tissue in
long strips. Denudation by nicking and snipping off little pieces is a
pernicious habit, delaying the operation and leaving an ugly jagged
surface which does not unite readily.

Buried Sutures.—The best of all methods for bringing together
broad surfaces of freshened tissue is by buried sutures of catgut,
recommended by Prof. Werth of Kiel. In this way, instead of grasp-
ing the whole denuded surface in a single loop, as seen in Fig. 255, A,
which when drawn up and tied puckers and purses the tissue, as seen
in B, with the exertion of considerable traction, the tension is here dis-
tributed over two or more layers of sutures, all but one of which are
hidden away out of sight, "buried" left in the tissue, and ultimately
absorbed, thus preserving the original depth of the wound, preventing
puckering, and distributing the tension necessary to bring the denuded
surfaces into contact. Surfaces can by this means be brought together
which could not possibly be drawn into apposition by a single row of
sutures embracing the whole depth of the wound.

The method is as follows: A needle threaded with catgut is entered
at the upper angle of the wound on its freshened surface, avoiding the
vaginal mucous membrane; the thread is drawn through and tied with
three knots to prevent slipping, when a continuous or interrupted
suture is carried down the bottom of the wound, about four to the inch,
until the lower angle is reached, as shown in Fig. 255, B. In using the

Fig. 255.
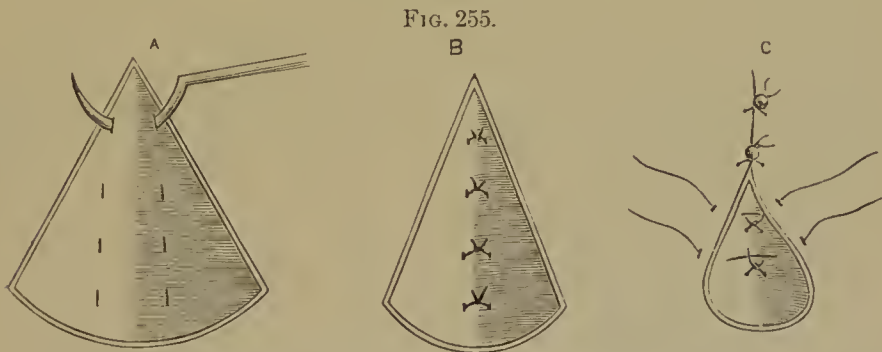
Closure of the Wound by Werth's Buried Sutures.

continuous suture, each time after the needle is drawn through the tis-
sue the catgut is pulled tant and held by an assistant, preventing slack
in the sutures already taken, and the wounded surface is thus accurately
approximated and diminished in size. Fig. 255, A, shows the area to
be approximated and the points of entrance of the sutures; B shows
the effect of the first tier of sutures introduced. Above this another
tier of sutures is taken, and so on until the whole denuded surface is
approximated. In using the running suture in the second row it is

continued back from the lower angle of the wound to the upper angle, the starting-place, to form the second tier, then down again, until the wound surface is closed. The rows of sutures thus laid one above the other must be evenly applied, and care taken to avoid encroachment upon the row immediately below or leaving any considerable space between the rows, avoiding also cutting the sutures below with the needle—an accident particularly disastrous in the use of the running suture. The sutures should not embrace more than from a quarter to a third of an inch of tissue in depth. The catgut used for this purpose should be slightly chromicized to prevent too rapid absorption.

The tissues thus joined will rapidly unite, and require no further attention than a dry dressing or occasional irrigation to ensure cleanliness. The sutures are absorbed about the time firm union has formed, and the wound requires no further attention.

The repair of the external tear resulting from the recent injury shown in Fig. 227 is simple, and may be confined to a free removal of the scar-tissue. When the scar has been taken away and the surrounding parts relieved from the traction, the denuded surface will be seen to be larger than expected, and the approximation of the raw surfaces on the opposing sides will then fully restore the parts to their original condition. The best suture materials are silkworm gut and silk. After the introduction of the sutures on the vaginal and skin surfaces, with superficial sutures in sufficient numbers to secure exact apposition and prevent pouting lips between the sutures, as shown in Fig. 268, the parts should be thoroughly dried and sprinkled with iodoform or the subiodide of bismuth. The patient may be allowed to turn over on to her face to urinate after the operation, and while keeping her bed need not preserve any special posture. She will require but little other care than rest and cleanliness until the removal of the stitches on the eighth day.

LACERATION OF THE PERINEUM INVOLVING THE SPHINCTER MUSCLE.

The symptoms and characteristic physical signs of this injury have already been described. The principles guiding the operator in the treatment of the injury are, in general, similar to those governing the treatment of the recent tear involving the sphincter, with the added differences and difficulties arising from changes produced by cicatrization, contraction of the sphincter, and the displacements consequent upon posture and strain. The chief difficulty lies in the extent of the denudation, its irregular form, and the number of sutures used, which are passed in different directions. The tension sometimes exerted by the sutures in opposite directions causes failure of union in the more

central parts, and ends by forming a recto-vaginal or recto-vulvar fistule.

A fundamental cause for failure lies in the communication of the wound with the rectum and the fecal contamination, also resulting in recto-vaginal fistule.

In this as in other perineal operations good results are never attained by fitting any particular pattern devised upon paper on the parts; but with the recognition of the individual peculiarities of each case and a correct appreciation of the changes which have been produced by time, and thus being able to retrace the parts back to the condition of the

FIG. 256.
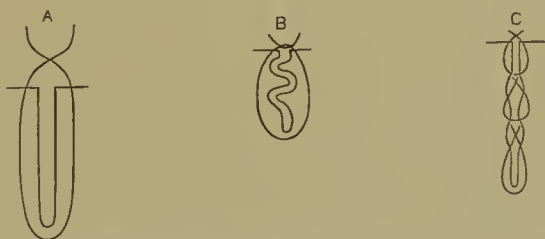
The comparison between single deep suture introduced at A, and drawn up, B, and the use of two rows of buried sutures, C.

recent tear, the denudation will be made intelligently, the tissues at hand utilized properly without undue sacrifice, and the approximation will be correct and the result satisfactory.

FIG. 257.

FIG. 258.

Rectal Tear up Septum.
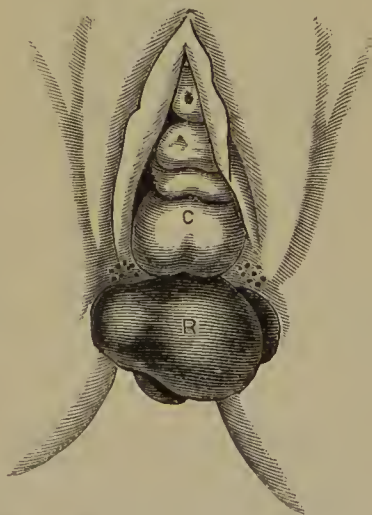
Complete Tear, with Prolapse of Anterior Vaginal Wall, C, and of the Rectum, R.

The rent which originally extended high up into the rectum still appears either as a deep sharp indentation, as shown in Fig. 257, or

appears instead as a narrow band extending transversely across the outlet, as seen in Fig. 238.   This band, bridging the rectal outlet and stretching from retracted sphincter ends on one side to those on the opposite side, is simply the deep rent in the septum displaced downward by sphincter action and pressure from above, as represented in Fig. 237, c and d : in d is the condition here found, with the zigzag line representing the scar-tissue, extending across between the two sphincter ends, while c represents the original condition of the tear before cicatrization and the action of intra-abdominal pressure assisting the downward displacement.   Fig. 258 represents a rarer accident of seventeen years' standing, liable to arise from complete tear, drawn from life. There was here prolapsus of uterus, vaginal walls, and rectum [R].

The various operations devised for the relief of the secondary operation on the complete tear may be classified as bilaterally symmetrical, where a certain pattern is fitted to all cases, the freshening on the opposing sides being exactly alike.   On the other hand, starting with Emmet and Freund and ending with Goodell, have arisen a series of rational operations utilizing the tissues as found and restoring them to their natural condition.   These are operations extending up the sulei and utilizing the tissue according to the character of the original injury.

Operations for Tear of Perineum through Sphincter.

Posterior median	Dieffenbach, Simon, Jobert de Lamballe, Baker Brown, Hildebrandt, Hegar.
Bilateral asymmetrical in the sulci	Freund, Emmet, Staude, Goodell.
Flap method	Voss, Duncan, Simpson, Saenger.

In 1859, Simon urged the correct principles which underlie all successful work, insisting that "a satisfactory union of the parts depended less upon methods and modifications of the operation than a careful attention to the principles, the basis of all successful plastic work." These principles are—good denudation into sound tissue, securing an even surface ; exact approximation of the wounded surfaces by sutures well applied and not exerting undue tension. Simon directed to freshen

the surfaces, removing too much rather than too little from the walls of the tear, as in the latter case union will surely be prevented. He prefers the knife as yielding a smoother surface, using scissors to clip off small prominences and for freshening the angle. Union is best secured by a number of interrupted superficial sutures on rectal and vaginal surfaces, closing the tear from the angle downward, when the great deep wedge thus left, extending from the skin perineum inward, is united by means of deep sutures attached to a quill on either side, alternating with superficial knotted sutures.

Hegar's operation is one of the simplest and most satisfactory of the posterior median methods. The shape of the denudation is shown in Fig. 259. The operation is conducted as follows:

Freshening.—The field of operation is exposed upon raising the anterior wall of the vagina by a suitable retractor. The outlying extremities of the new perineum about to be formed are seized by a tenaculum or forceps on both sides, and drawn in opposite directions: thus the points A B and C D in Fig. 259 are caught, and the operation is begun by denuding the small triangle N X M in the figure, point X being exactly the median line of the posterior vaginal wall about two centimeters above the margin of the rectal tear. The removal of this small triangular area prevents the formation of a prominence in the vaginal wall at this point upon passing the sutures, and assists materially in bringing together the freshened surfaces below. It also adds greatly to the

Fig. 259.

Hegar's Operation for Complete Tear.

thickness of the scar in the recto-vaginal septum, and diminishes the likelihood of the formation of fistule. The incision is now continued from this triangular area in a gently curved line to the points A and B, which are to form, when united, the posterior commissure.

These points, A and B, lie at the inner margin of the lowest part of the labia majora. From here the line of demarcation is continued along A C and B D, which form the boundaries of the future skin perineum. Care must be taken not to extend the lower part of this incision too far out on the skin surface, as in that case, after union, a roof of overhanging tissue would be built down in front of the anus. The freshening is next continued across the margin of the rectal tear on the
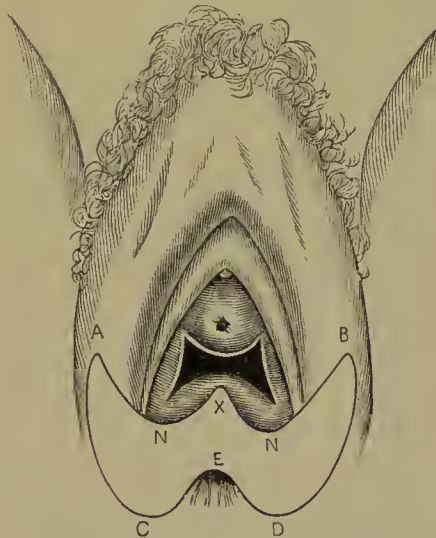
lines C E and D E. This is best accomplished with a pair of scissors.
Within the limits of these freshened outlines the tissue is removed
by means of a scalpel to the depth of two or three millimeters; the
loosened margin is caught with a pair of pincers, and the whole cir-
cumscribed flap dissected off from above and from the sides with the
flat surface of the knife. Active hemorrhage should be checked by
means of artery-clips; when these are removed before passing the
sutures, the tissue which has been crushed in their grasp should be
snipped off, and the suture will control further bleeding. It is scarcely
ever necessary to tie separate vessels. The mistake made by begin-
ners is, in general, too great an exaggeration of the various steps.
When the tear extends deeper the form of the denudation must be
modified accordingly. The sutures are introduced as shown in Figs.
260 and 261.

After denudation the operator proceeds to pass the vaginal sutures.
These are introduced by means of a semicircular needle entering three

Fig. 260.
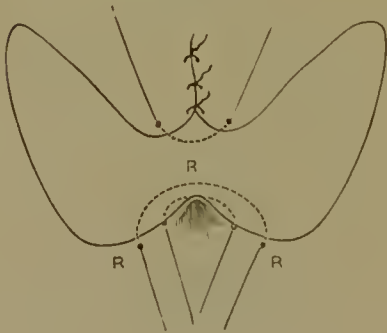
Fig. 261.
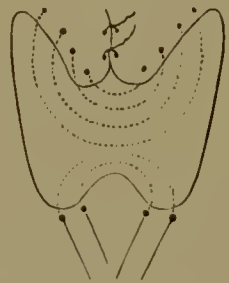
Hegar's Operation: method of suturing.

millimeters from the margin of the denudation and carried across to
the other side, encircling the whole wounded surface and brought out
at a point exactly opposite to that of introduction. As the denuded
surface grows broader the operator brings the needle out near the mid-
dle of the wound and reintroduces it again, so as not to enclose too
much tissue and facilitate the bringing together of the denuded sur-
faces. After a number of vaginal sutures have been passed the rectal
sutures are to be introduced as shown in the diagram. These are also
passed three millimeters from the margin of the incision, sweep around
to the angle of the tear concealed by the tissue, brought out and rein-
troduced, appearing on the rectal surface at a point opposite to that of
entrance. The free ends of these sutures hang out of the rectum, and,
as wire is often painful and difficult to remove, carbolized silk or cat-
gut is preferred; these require no further care. Rectal and vaginal
sutures are now introduced alternately, sutures enclosing less tissue

varying with deep sutures, introducing both with careful attention to
the amount of traction exerted on the tissues. On the vaginal side it
is necessary to introduce a number of superficial sutures accurately
approximating the mucous membrane. The stitches are knotted as a
rule when introduced, and only when tension is considerable is it
necessary before bringing up and tying the deep sutures to pass one or
more relief sutures extending a shorter distance into the tissue. In
this way the denuded surface is gradually narrowed down, and the
operator holds in view an exact appreciation of the effect of each sepa-
rate suture. When, finally, the whole surface of denudation in rectum
and vagina has been closed, the perineal sutures are introduced; while
these are being brought together the limbs must be approximated to
diminish the tension. The important point to be borne in mind in
passing the sutures is that the whole freshened surface should be caught
up by the sutures, and so accurately brought together that no spaces
shall remain between the suture rows. After conclusion of the suturing
the blood which has collected between the lips of the wound must be
pressed out by the fingers, and the vagina, rectum, and perineum thor-
oughly disinfected. It is proper then to divide the sphincter ani mus-
cle subcutaneously or make an open wound by a median or two lateral
incisions in its posterior margin. The favorable effect of the division
of the sphincter, according to Hegar, rests less upon the fact that ten-
sion is taken from the rectal stitches than that feces and flatus for the
first few days after the operation are thus permitted to pass freely away
without distension or traction upon the rectum. The advantage of
this triangular method of Hegar is, according to his estimate, its great
simplicity. The form of the surface freshened is most favorable for
plastic substitution of the uninjured perineum, which affords a union
from opposite sides with the least possible tension and the least loss of
the tissue: and, further, it is applicable in all cases.

We must urgently dissent from Hegar's opinion as to the necessity
of dividing the sphincter muscle, which will not be necessary if the
sutures are carefully passed with a view to bringing together the
denuded sphincter ends, as described in the operation for the recent
injury.

HILDEBRANDT'S OPERATION is one which has long been widely
and successfully practised. It represents important points of differ-
ence from Hegar's, particularly in the method of passing the sutures.
He divides the operation into two steps—the freshening and the suture.

The Freshening.—After a suitable preparation the patient is brought
into position on the table, the parts exposed, and the peculiarities of
the case carefully studied. The field of operation is kept in view by
the hands of a skilled assistant, which is preferable to the use of the
tenaculum or a Simon's speculum. The denudation must frequently

not be limited to the scar-tissue, but must extend even to a considerable distance beyond the scar-limits and well on to the labia majora. With these guiding principles, according to the size and shape of the tear the field of denudation is mapped out with the point of the knife in the shape somewhat approaching that shown in Fig. 262.   Be-

FIG. 262.
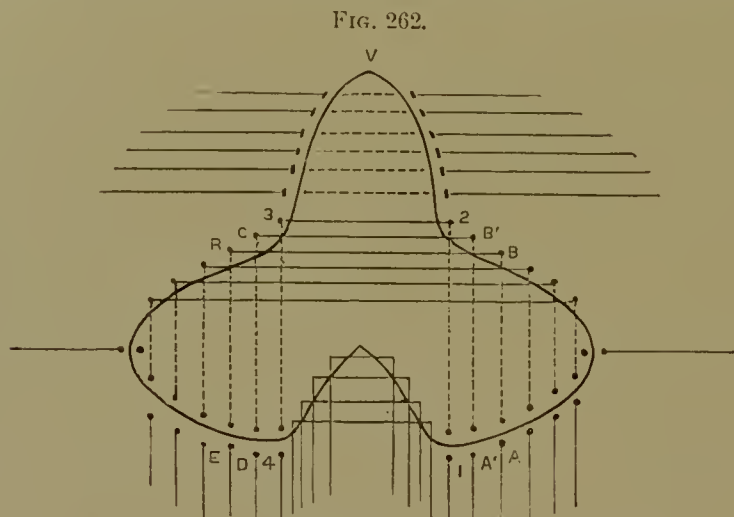
Hildebrandt's Operation.

yond the broad denudation on either side a triangular figure is continued up on the posterior wall of the vagina, with the intention, after approximating the two sides of this bilateral symmetrical figure, to bring about union in such a way as to secure a gentle curve from the cervix uteri down the vagina and up over the newly-formed perineum.   The whole figure should be made sufficiently extensive to give breadth and strength to the new perineum.

Hildebrandt prefers the knife for the freshening throughout.   At the margins of the denudations the point is entered vertically into the tissues, while the removal of the flaps on either side follows by means of long-drawn cuts with the flat surface of the blade parallel to the tissue.   Hildebrandt has placed before himself as his chief object in the restoration of the perineum the formation of a deep perineal wedge gently sloping up on the posterior vaginal wall to the cervix, using every effort to avoid a simple skin union.

The Suture.—In passing the suture the important points to be borne in mind are—

1st, that these enter in three directions—on the vaginal side, the rectal side, and on the side of the skin perineum ;

2d, that the deep sutures should only be passed from one of the two last-named directions, and superficially from the other.

Hildebrandt prefers iron wire for his suture material, and the

introduction of all sutures before twisting any, as affording a better means of judging effect and the proper depth for the insertion of those which remain. The wounded surface must be kept absolutely clean while bringing up the sutures. The utmost importance is placed upon the after-treatment. The daily catheterization is to be avoided as far as possible, and the wound washed with a solution of salicylic acid in water. Moderate movements of the bowels are to be secured by daily injections. The best posture for the patient is the side position. The perineal sutures are removed from the sixth to the eighth day, and the sutures at the sphincter and in the rectum when they begin to cut; and the vaginal sutures from the tenth to the fourteenth day.

STAUDE'S OPERATION.—One of the most satisfactory of all methods for uniting an old complete tear of the perineum which has extended into the vagina beyond the apex of the columna is that recommended by Dr. Staude of Hamburg. The important steps are as follows:

The Denudation.—After separating the labia, and discovering how far on either side of the columna the tear has extended, the operator begins to freshen the tissue at the point where the scar extends deepest into the vagina. The freshening is extended down toward the skin surface of the perineum somewhat beyond the limits of the visible scar, and is then carried up on the opposite side of the columna in like manner until on both sides of the perineum two triangles are formed, as shown in Fig. 263. The apices of the two triangles formed are in the

FIG. 263.
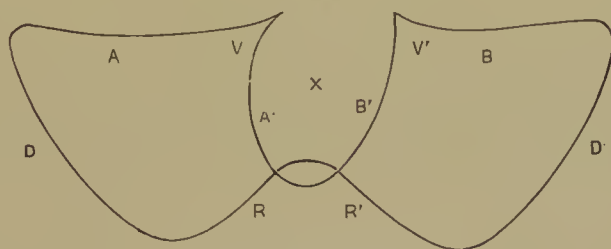
Staude's Operation.

sulci of the vagina, pointing toward the cervix; the sides are on the vaginal and rectal surfaces, and the base at the skin perineum. Over this figure the columna hangs denuded on its sides, but drawn down and attached by the contracted scar-tissue beneath; this must be so far separated beneath that its point can easily be brought down to the skin, and the denudation continued beneath and around its margin, when the parts are ready for suture.

The Suture.—Sutures of carbolized silk are used, beginning at the apex of the tear in the vagina, uniting the margins of the columna to the freshened border of the vaginal wall on either side by a series of superficial sutures, until the apex of the rectal tear is reached, when the

principal sutures are passed from the rectal surface, entering on one side, embracing nearly the whole depth of the denudation, catching the under surface of the loose columna, re-entering on the lateral wall, to reappear at a point corresponding to that of entrance, as shown in Fig. 264.

Fig. 264.
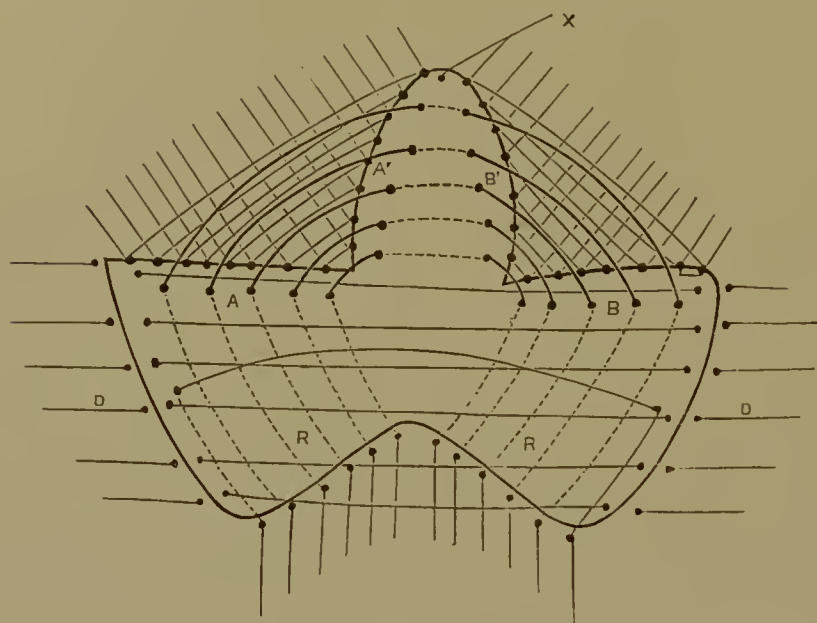
Sutures in Staude's Operation.

GOODELL'S OPERATION.—Prof. Goodell has for some years past made use of an operative procedure similar in character to that just described,[1] which has yielded in the writer's hands, as well as his own, excellent results. The important features of the method are the following :

The Denudation.—Introducing two fingers into the bowel, the overlying tissues are put on the stretch, and with a pair of curved scissors the tissue is cut off the rectal margin of the rent in a narrow ribbon, including at the same time the retracted ends of the sphincter, which are hooked out by a tenaculum and thus brought within reach. This denudation is continued from side to side and back again, and carried simultaneously upward toward the vaginal surface and outward on to the skin surface of the perineum. The two figures on opposing sides are made exactly similar. Just above the apex of the tear the vaginal mucous membrane is caught with the forceps, and, instead of cutting away the tissue, it is dissected off in the form of a triangular flap, to be utilized shortly in the formation of the perineum.

The Suture.—A curved needle armed with silver wire is entered on

[1] *Lessons in Gynecology,* Wm. Goodell, Philada., 1887.

a level with the lower margin of the anus, about half an inch away from it, and carried with a sweep around through the recto-vaginal septum, remaining completely buried until it reappears at the corresponding point on the other side. If the rectal rent is not too deep, one or two additional sutures may be passed in this way, entering the perineum at points successively higher. The remaining sutures should be introduced on the skin surface of the perineum, emerging on the raw surfaces of the denudation near the vaginal margin, transfixing the flap dissected up from the posterior wall of the vagina on its under surface, entering the opposing denuded surface on the lateral wall near its vaginal margin, and reappearing on the skin surface of the opposite side at a point corresponding to that of the original entrance. It is important to avoid piercing the undenuded surface of the vaginal flap. The sutures which transfix the flap must, when twisted, be invisible, excepting on the skin surface of the perineum. In no case has a flap ever sloughed or failed to unite.

In this as in the other operations the success depends largely upon the after-treatment. The patient's urine should be drawn as often as necessary. Opium should be given when the tension of the sutures is painful. The wound should be kept clean and dusted daily with iodoform. Food should be restricted. The bowels are to be opened on the third day by an aperient, preferably castor oil or Epsom salts, administered every four hours until a motion is secured. On the eighth day, after securing a movement, the stitches are removed ; after this a disinfecting vaginal douche is given twice daily. The patient should remain in bed for at least two weeks with her knees bound together. She is not to be allowed to walk about until the end of the third week.

FLAP OPERATIONS.—When a patient has undergone a series of unsuccessful operations with great loss of tissue, the best method of treatment is repair of the perineum by splitting the recto-vaginal septum and forming flaps, which are drawn up toward the vagina and down toward the rectum, and the tissues brought together from the opposing sides by transverse sutures. This method of operating for complete tear of the perineum has attained its fullest development within the past few years. Already foreshadowed by Langenbeck's method of perineo-synthesis, it has remained for more recent operators to develop its full details and elevate it to a scientific position. Thus Saenger of Leipzig has recently carefully elaborated the whole subject and given it its proper status historically and practically. He has shown that Prof. Voos in Christiania has well described this method by two simple but excellent diagrams in the *Norsk Magazin for Laegevidenskaben* (2 Reihe, 24 Bd.). (See Fig. 265.)

In Fig. 265, taken from Saenger's work describing Voos' method, the larger oval above (Fig. 265, A) represents the vaginal outlet, and

the small circle below a cross section of the rectum. The space between the oval and the circle represents the recto-vaginal septum. The operation is carried out by splitting the septum transversely and suturing on the vaginal and rectal sides separately ; the margins of the tear then form a broad skin perineum where previous to the operation

FIG. 265.
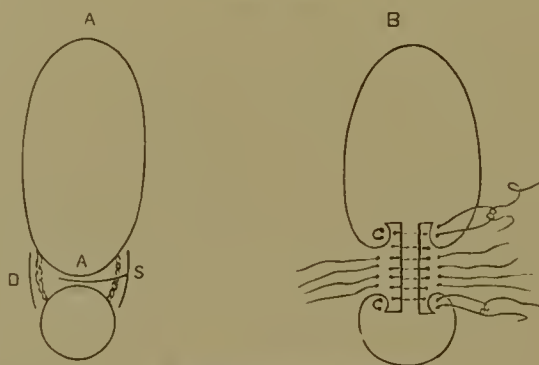
Voos' Method, taken from Saenger.

none had existed, and this is brought together by means of the four transverse sutures shown in the right-hand diagram. The operation thus simply figured and described contains all the essentials of the best conducted flap operation. Voos reported two cases, after one of which a small recto-vaginal fistule remained, as was the case in one or two patients of Nicolaysen's, who operated according to an original modification of this method.

The flap operation has long been in use in the city of Edinburgh, dating from the time of Dr. John Duncan, and has been practised for many years by Prof. A. R. Simpson, as described in Hart's and Barbour's *Manual.* The figures which are here reproduced (Fig. 265, A, B) are taken from manuscript given the writer by Dr. Saenger of Leipzig, and will elucidate the text as we describe this method.[1] After proper exposure of parts an incision is made from the point s, splitting the sharp border of the tear, bridging over the rectum, extending into the labia on either side. The second incision is carried from the lower extremity of the nymphæ parallel to the vaginal orifice, and meeting the outer extremities of the transverse incision at s. This vertical incision is continued on to the margin of the torn sphincter. The incisions on both sides are symmetrical ; they are continued deeply into the tissues, and the flaps thus marked out are dissected carefully up on both sides and brought together.

The upper flap is thus made to form the floor of the vagina, while the union of the margins of the lower flap closes the tear in the rectum. Silver wire or silk sutures are used on the vaginal surfaces and left long.

[1] *Volkman's Sammlung,* No. 309, p. 2177.

Catgut is used on the rectal surface and the threads cut short. In this way the rectal and vaginal canals are restored to their natural length. The final step consists in bringing together the triangular raw surfaces on either side extending in from the skin perineum, thus restoring the perineum in the form of a deep wedge. This is usually brought about by two strong, deep sutures of silver wire and a series of superficial sutures between, to bring the skin margins into more accurate approximation.

Saenger advises a fine scalpel for splitting the septum instead of scissors, as with this the danger of penetrating either rectum or vagina

Fig. 266.
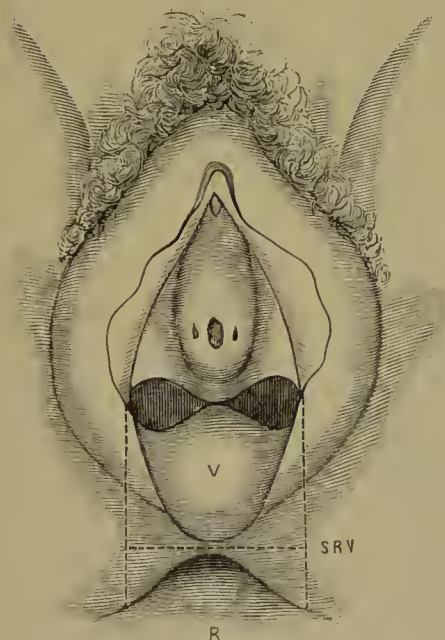
Flap Method for Complete Tear of the Perineum, taken from Saenger.

Fig. 267.
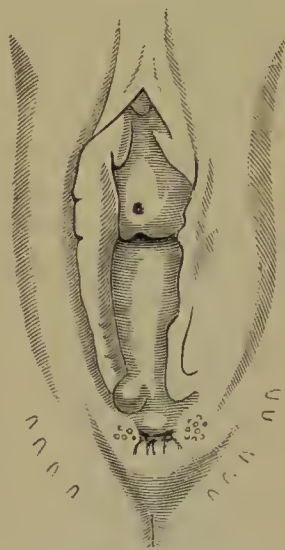
Complete Tear operated upon eleven times.

with the point is less. The deeper the tear the deeper must the knife enter the septum. The incision through the septum is continued outside to the right and left in a horizontal plane to a point vertically below the terminal extremities of the nymphæ, as seen in the diagram. Then with the scissors from this point an incision is made vertically downward on both sides of the torn ends of the sphincter. In this way an H-shaped figure is formed, with the lower bars shorter. The two folds form a vaginal and a rectal flap. These are caught and further separated by forceps, and by a careful use of the scissors separated by continuing inward the external incisions.

If left to themselves, the rectal and vaginal flaps thus formed make a concave arch looking toward rectum and vagina respectively. These

must be caught in the middle by forceps and carried downward and upward, so that the whole wounded surface comes to be in two vertical planes. (See also Fig. 268, B and C.) From three to six silver wires are passed—first, one through the middle, the others on either side of this —and the opposing surfaces brought accurately together; and further, according to Saenger's plan, all the sutures are laid from the skin surface of the perineum, and the vagina and rectum not sutured separately, or at most but few superficial sutures are passed. The bowels should be moved on the third day after the operation and every second day following this. The wound surface is kept clean and sprinkled with iodoform powder. The superficial sutures are to be removed on the seventh day, and the silver wire on the fourteenth day. Saenger states that the results are so perfect that the perineum may often with difficulty be distinguished from the perfectly normal.

Fig. 267 was cured by this means by the writer after ten previous operations. All available tissue had been sacrificed, and the position of the perineum was occupied with a deep cup-shaped depression

FIG. 268.
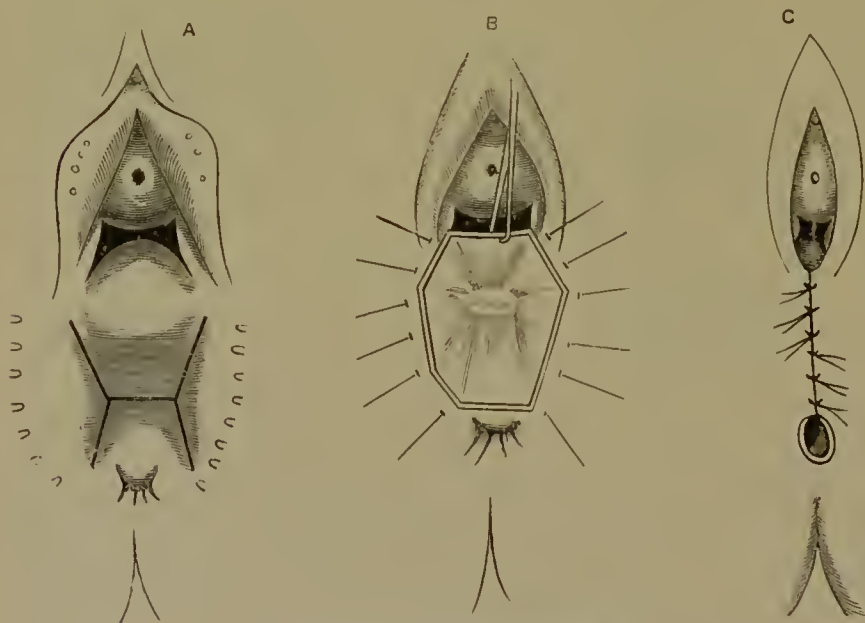
Method of Repair adopted in previous cases.

floored with cicatricial tissue. Perineal sutures only from the skin margin were introduced here after making the flaps described above. The result was excellent. The method is shown in Fig. 268.

Relaxation.

Under this title we proceed to describe the treatment of injuries of the pelvic floor and perineum characterized in the secondary stage by a lax, open vaginal outlet, with more or less tendency to prolapsus of the structures above, shown by the formation of rectocele, cystocele, and prolapsus uteri, or more rarely by the strain of other muscular fibres endeavoring to do duty in closing the relaxed outlet in place of those normally guarding it, but sacrificed by the injury.

We wish to assert again that laceration of the perineum not involving the sphincter has but rarely any significance beyond its association with relaxation of the pelvic floor or vaginal outlet. The destruction of tissue or tear of the fibres entering into the superficial external perineum, as seen in Fig. 228, is not productive of harm unless associated with the deeper separation of the levator fibres controlling the vaginal outlet. The natural and frequent association of the superficial with the deeper injury has led to the serious error of attributing the consequences of the latter invisible injury to the former, which can always be seen.

GROWTH OF PERINEAL OPERATIONS.—The history of the growth of perineal surgery is one of interest. Beginning at the most accessible parts with a simple horseshoe denudation on the outside, on the vulva, designed to form a barrier in front of the outlet to bear and keep back the weight of structures tending to prolapse, operators gradually extended their work up into the vagina, fitting upon its posterior wall all conceivable patterns which could be drawn upon paper, from the horseshoe on the outside to the figure of Simon, crossing the outlet, and to the great triangular denudation of Hegar, extending from the vulva up to the cervix on the posterior vaginal wall. This growth of a perineal operation from a simple transverse union of the labia across the outlet, to an operation embracing a great width of the posterior vaginal wall from perineum to cervix, has been brought about by the realization of the necessity of in some way caring for the rectocele, disposing of the lax tissue in the posterior vaginal wall, and preventing it from prolapsing over the bridge of union formed by the operation.

It will be observed in consulting Fig. 269 that, however widely various operations may differ in form, they all agree in one important point bearing critically upon our remarks on relaxation, which results in their having the greatest average breadth of denudation at a point lying in the position of the outlet as described. Here the union is strongest, and here is the common cause for the successful results attending these different operations.

The mechanical effect of all posterior median operations is the same. In Fig. 270, A, is represented a lax outlet with a prominent rounded

rectocele filling the lumen of the dilated vagina. The effect of turning thus in upon itself in the posterior median operation is shown in B by the strong cicatrix in the middle line, while in C is shown one of the effects of utilizing the sulci and interposing two lateral bars of scar-tissue according to the more rational method to be described.

Fig. 269.
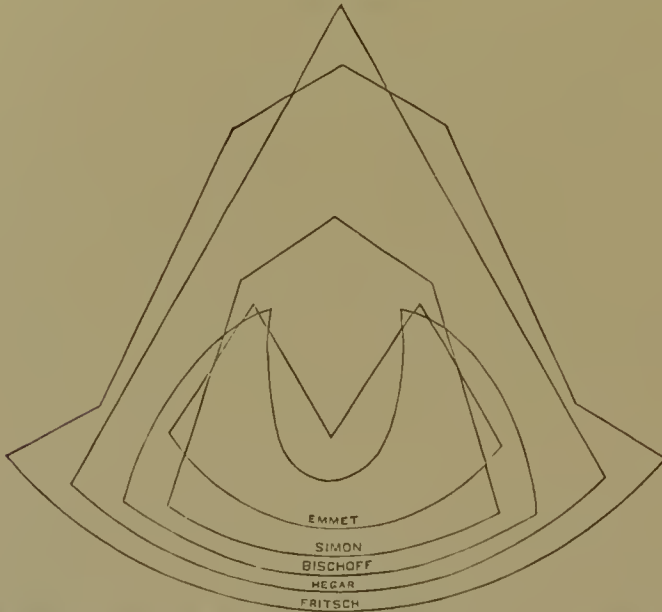
Superimposed Diagrams of Fritsch's, Hegar's, Bischoff's, Simon's, and Emmet's Operations.

It has remained for more recent times to develop the methods of operating, utilizing the sulci, and in place of inverting the rectocele on itself, and, gaining support simply from a median bar of scar-tissue, to make the denudation on both sides of the rectocele, catching up the lax

Fig. 270.
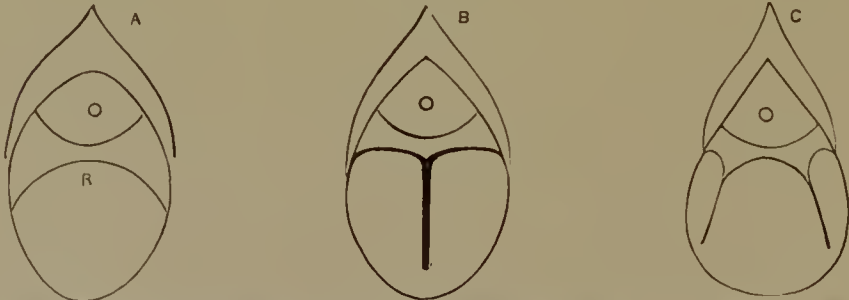
A, diagrammatic relaxed outlet; B, result of turning the rectocele in on itself by a posterior median operation; C, union in the sulci by a method similar to Emmet's.

fibres hanging from the pubic rami and bringing them back to their former attachments, as shown in Fig. 264, uniting the parts where they have been torn, and interposing as well two lateral bars of scar-

tissue (Fig. 270, c). The operation of Bischoff, sparing the posterior median surface of the vagina, distinctly foreshadowed these methods, his object being to dissect off a flap, make a broad denudation on the sides, raise the flap to a higher level, reattaching it on each side, so that it continued to form the floor of the vagina.

Martin of Berlin fully appreciated the principles involved when he invented his operation, insisting upon the advantages of using the sulci for denudation and support, instead of the posterior median surface of the vagina.

It has remained for the genius of our own Dr. T. A. Emmet to devise the most perfect of all natural methods of repair for these cases of relaxation—a method which, utilizing the sulci on either side of the columna, and by a few stitches, passed as shown in Fig. 243, lifting high up and putting away the rectocele, and by a single gathering stitch around the denuded tissues at the outlet bringing all together and closing the whole wound.

As long as the dictum prevails that the functional value of a perineum is in direct ratio to its depth on the skin surface, just so long

Fig. 271.
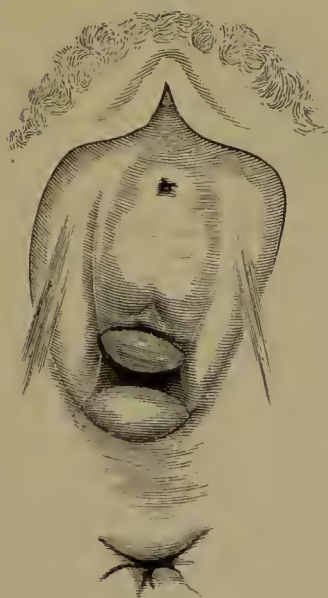
Relaxed Outlet.

Fig. 272.

The Same, at Rest.

will many of the worst cases applying for relief continue to carry their burden and suffer. The rule is the opposite. The functional activity of the perineum is in inverse order to its depth on the skin surface. Fig. 271 shows just such a relaxed perineum drawn from nature, and its utter uselessness is shown by applying the test described, exhibited in Fig. 273.

The perineum of Fig. 231 is one of unusual depth, and in addition to this fact its nature may already excite suspicion from the few wrinkles crossing it, as well as the tip of the rectocele seen peeping over the fourchette, which is uninjured. The backward displacement of the anus, no longer lying pinched up in the cleft, is also remarkable. Upon hooking a finger in the outlet on either side, pulling backward

Fig. 273.
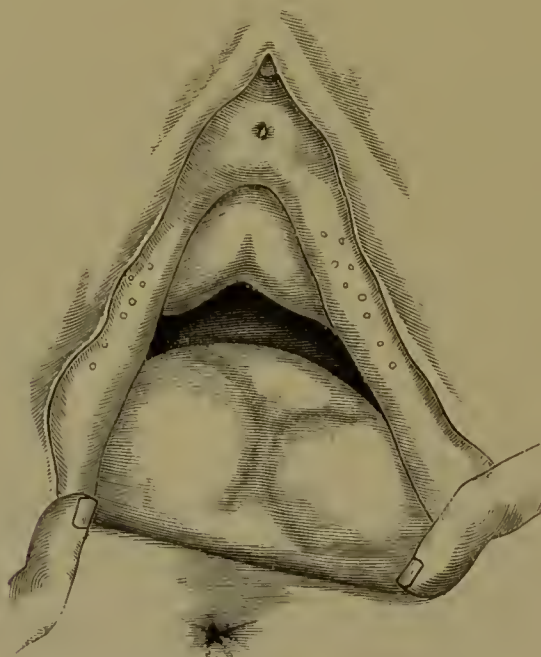
Test showing Relaxation of the same Outlet.

and outward and carrying the fingers toward the pubic rami, as shown in Fig. 273, the lax condition of the outlet is exhibited beyond a cavil by the great tendency of the whole posterior wall to roll out and the large dilated outlet exposed. In this case the writer was able to introduce his fist without stretching the parts.

Fig. 234 shows, as described, a picture often seen upon attempting in this manner to evert a lax outlet, and in Fig. 235 is shown the result of taking the semi-prone position when the posterior vaginal wall, losing its normal support, and no longer forced into contact with the anterior wall by the intra-abdominal pressure, now drops back, leaving a large opening, allowing the air to enter and escape freely with the respiration of the patient. In an uninjured outlet such an appearance as is shown here is never seen.

Of the posterior median operations, Hegar's is the best, and is described as the type. This operation has the great merit of simplicity of device, both in the denudation and the suturing, as well as

efficiency in narrowing the dilated vaginal canal and affording a firm barrier of scar-tissue, often effectually preventing any further prolapsus.

The form of the figure is a simple triangle (Fig. 269) extending from the vulva at its base to its apex at the cervix. The size of this triangle, its length, and its breadth vary with the length of the vaginal canal and the size and laxity of the outlet. For average cases this is from two to two and a half inches in breadth by two and a half in length, extending even to three inches in breadth by three and a half in length.

The day before the operation the patient is to be prepared by having her bowels thoroughly opened and the parts well washed with a disinfecting solution.

HEGAR'S OPERATION.—The patient is placed in the lithotomy position. Four to five assistants are needed—two to hold the legs flexed and the tenacula exposing the parts; the third man hands the instruments; and the fourth administers the anæsthetic. The first step is to fully expose the field of operation. To this end a stout tenaculum is caught in the posterior lip of the cervix, which is inverted and drawn downward and at the same time lifted upward, as seen in Fig. 274, where the

FIG. 274.
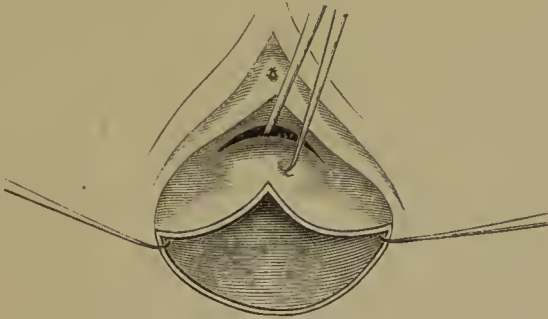
Hegar's Operation, foreshortened.

figure of denudation is the same as shown in Fig. 269, being here represented as foreshortened. The other tenacula are fixed in the lowest part of the labia majora, a little more than an inch from the perineal raphé on either side, and drawn forcibly to both sides. In this way the field for operation is exposed.

The base of the triangle runs in a curve across the posterior commissure, as seen in Fig. 269. From the two extremities of this line the incision extends up on each side of the posterior vaginal wall, meeting in a sharp angle just below the cervix, as seen in the figure.

The first step is to begin by starting an incision behind the cervix, and extending it down the sides, as shown ; a flap large enough to be held in the fingers is separated at the apex and pulled downward, and with the fingers and a scalpel the rest of the flap is freed, making a triangular section of the posterior wall. The rectum is protected when the recto-vaginal septum is very thin by introducing the finger, while denuding, into the bowel and everting it. Any large, actively-bleeding vessels must be caught and held by artery-forceps.

When the denudation has been made thus far, leaving a large triangular flap, involving the whole thickness of the vaginal wall, in the operator's hand, the curved incision sweeping across the posterior commissure connecting the two lateral incisions follows, and the whole flap is removed. The whole denudation can be made very rapidly, occupying usually not longer than from three to five minutes. After this freshening the surface is smoothed of all undenuded islets and irregularities by scissors curved on the flat. The wounded surface is then carefully irrigated and larger bleeding vessels tied with catgut.

Suturing.—Passing the sutures is the last step. Of prime importance is the passage of a sufficient number of deep sutures underlying the whole denuded area, in order that no pockets be left for the accumulation of blood and secretions. These sutures should be introduced at a distance a little more than a third of an inch apart, and between every two of these deep sutures a superficial suture uniting more exactly the borders of the wound and preventing the entrance of vaginal secretions.

The union of surfaces begins at the apex, and as soon as several deep sutures are laid they are drawn up and tied. By this means an exact account is kept of the work being done by each suture, and the others which follow may be introduced to correct any defect in the apposition, which may also be assisted by sutures between the deep and the superficial extending halfway to the depth of the wound.

For these vaginal sutures silver wire is to be preferred. When all the sutures have been thus entered on the vaginal surface a few perineal sutures, penetrating about a half inch, will close the wound. For these sutures silk is preferable.

EMMET'S OPERATION.—In marked contrast to all previous operations, of which Hegar's just described stands as a type, is the operation for relaxation devised by Dr. T. A. Emmet. Its peculiarity lies both in the denudation, which is posterior median in front and bilateral on either side of the columna, extending into the right and left sulci, and in the sutures, which are so planned as to lift the prolapsing outlet up to the pubic arch, uniting the parts in their natural position and preserving the normal H-shape of the vagina. The object of the operation is to carry the denudation up the sulci on each side of the rectocele or columna deep enough to expose the fibres connecting the levator ani and

rectum (Fig. 243, A), and by suture bring the fibres on the lateral wall and rectum into contact and secure their union in this position.

The procedure is difficult to describe, and may perhaps be better exhibited by means of diagrams taken from cases.

After the preparation of the patient customary in other procedures, seeing that her bowels have been thoroughly moved, repeated careful cleansing of the parts, and absti-
nence from the customary meal immediately preceding the opera-
tion, she is anæsthetized and lifted on to the table; the clothes are drawn well up under the back, and the hips brought to the edge of the table over the perineal pad. The rings R R of the halter (Fig. 275) are then slipped over the legs and carried up above the knees, and the thighs flexed on the abdomen. The neck-yoke of the halter is then pulled through the ring of one side and snapped into one of the rings on its own inner side; it is then car-
ried under one arm up and across the back of the neck, and down

FIG. 275.

Simple apparatus for holding thighs flexed on abdomen, taking the place of more expen-
sive cumbersome crutches; it is called "Beinhalter," or "leg-holder."

over the other shoulder, to be snapped in the ring holding the thigh up on the opposite side. The halter thus placed pulls the knees upward

FIG. 276.

Denudation in the Emmet Operation.

and outward, and does away entirely with the clumsy cross-bar between

the knees common to other halters or crutches. The manner of passing it under the arm on one side and over the neck on the other prevents also pressure upon the jugulars. The principal point in the use of the halter is to leave no slack, pulling the yoke up tight until both thighs closely hug the abdominal walls.

The irrigator is hung on the wall near by, and the discharge-tube held in the hand of one of the assistants; another assistant stands by the other leg, and a third places himself at the right hand of the operator, with all the instruments close by, ready to hand them as needed. It is my custom in my hospital to have a fourth to receive any instrument soiled with blood, wash it at once, and return it to the pan, or if not wanted to put it away. The operator and assistants having all thoroughly washed their hands before beginning, the assistant at the right leg begins by playing water freely on the parts, which are douched, washed, and cleansed for the last time.

FIG. 277.
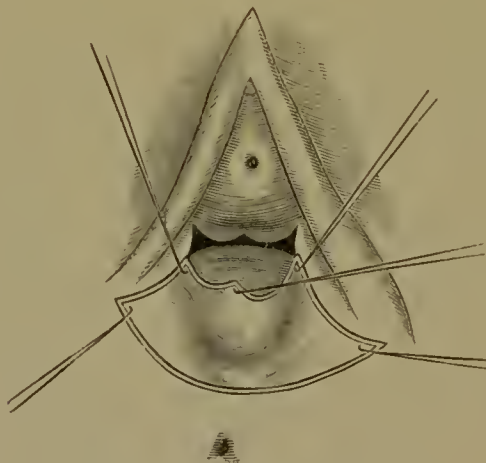
Denudation in the Emmet Operation.

The first object of the operation is to effect a denudation like that seen in Figs. 276 and 277. The labia are separated, and a tenaculum fastened into the crest of the rectocele (Fig. 276, C R). This is pulled well over to one side, exposing the side of the rectocele, as seen well in Fig. 278, then hooking another tenaculum into the tissue near one of the caruncles at the upper part of the outlet. This is drawn out in the opposite direction, and a triangle is formed by the natural drawing of the tissues into the sulcus, as shown in Fig. 279; seen also in Fig. 280, B C R and F E R. Care must be taken not to insert the tenaculum on the side, out on the vulva, as the traction then has a tendency to form a triangle pointing at the pubic bone, the point of greatest resistance at the outlet. The denudation of such a triangle would result, after

suturing, in rolling the outlet outward more than ever—an accident which has actually occurred. This false point is shown at x, Fig. 279, and on the lateral wall near the outlet in Fig. 278.

FIG. 278.
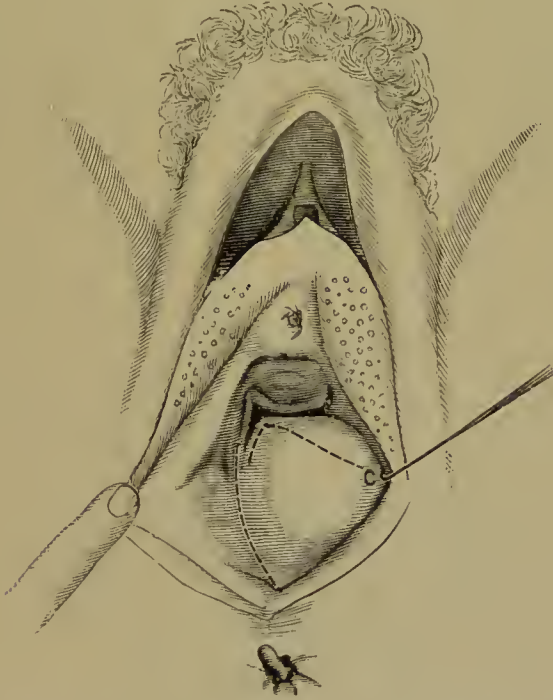
Crest of Rectocele drawn to the left to expose the right sulcus for denudation.

The extent of the denudation up into the sulcus varies with the amount of slack in the posterior vaginal wall which is to be taken up. In a simple relaxed outlet, upon drawing the crest to the opposite side and drawing the caruncle down and out, the apex of the triangle spoken of is brought down in a direct line with these two points, and the denudation, if carried straight across, will, upon releasing the tension, then form a distinct triangle in the sulcus.

The area above defined, seen in Figs. 276, 277, 278, 279, and 280, must now be denuded. The assistants hold the tenacula, exposing the field for denudation, while the operator begins to take long sweeping cuts with scissors, catching up a little tissue near the crest of the recto-cele with a tenaculum, and cutting with the scissors straight across to the other tenaculum, then back again, and so on, often removing the whole surface in one continuous strip, held by the fingers as soon as it is long enough to pick up.

If the outlet is very lax and the vaginal canal above greatly dis-tended, it will be necessary to continue a broad area of denudation farther up into the sulcus. The removal of tissue should extend down

through the thickness of the vaginal wall and at the bottom of the sulcus deep into the tissue below.

When the denudation on one side has been completed in this way, it is then continued on the other side in a similar manner by drawing the crest of the rectocele in the opposite direction and catching a caruncle on the level to which it is desired to raise the outlet, and denuding the triangle thus exposed.

It must be borne in mind that this is emphatically an inside operation, and the addition of any extensive denudation reaching out upon

Fig. 279.
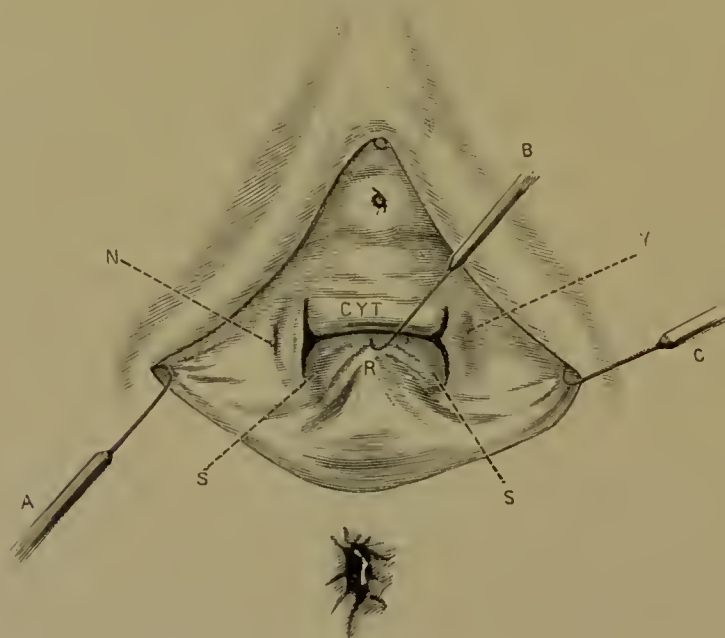
Showing Sulci up which Denudation extends.

the labia builds up a cumbersome structure, the larger part of which is an unnecessary, useless addition. The truly effective part is that which lies just under the pubic arch and inside the vaginal outlet.

If after thus denuding the triangles in the sulci, seen in Figs. 276, 277, and 278, any part of the tissue in front of the rectocele included in the area A R G, Fig. 280, remains undenuded, this must also be included, so that the line B A G F sweeps from the caruncle B on the right side down to the fourchette and up to the caruncle F on the left side.

When the relaxation is due to separation of the fibres chiefly on one side, as in Fig. 281, where most marked in the right sulcus, the denudation should extend deeper on that side, giving a figure like that in Fig. 247, A.

The Suture.—The system of suturing devised by Dr. Emmet is as

skilfully planned as the denudation, succeeding by a few stitches prop-
erly applied in lifting the lax floor and restoring the dilated outlet in

Fig. 280.
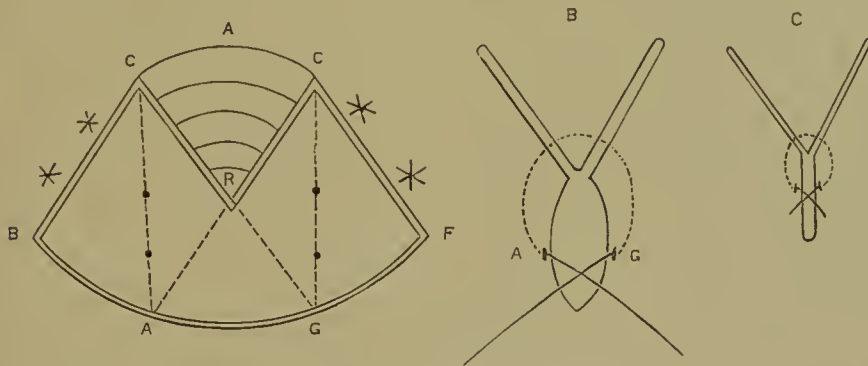
Diagrams of Emmet's Operation.

a manner which appears to one seeing the operation for the first time
as little less than marvellous. Silver wire and silkworm gut are the

Fig. 281.
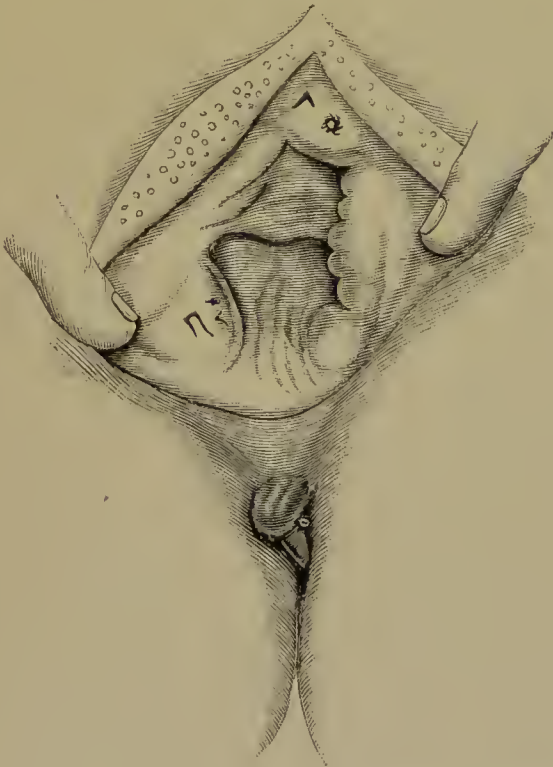
Relaxation, separation of fibres, principally on right side.

best suture materials. Each suture should be about eight inches in
length: from ten to twelve are ordinarily used. They are best carried

through the tissues into place by means of a straight or a curved needle armed with a loop of silk acting as a leader.

Inasmuch as it is the design of the operation that each suture in the vagina should exercise a definite amount of lifting power, it is obvious that the end will not be reached by simple transverse union, which, it is true, narrows the outlet, but does not elevate the prolapsing tissue.

Vaginal Sutures.—Upon exposing one of the triangles extending into the sulcus, the first stitch is passed transversely under the apex of the triangle (Fig. 276). This may be tied at once, closing the apex. The next stitch enters on the rectocele close to the margin of the denudation, about a fifth of an inch below the first, and is carried in a direction toward the operator, and brought out at the bottom of the sulcus at a point much lower down than the point of entrance, as seen in Figs. 247 and 276. The needle, thus brought out at the bottom of the sulcus, is re-entered near the same point, and carried up away from the operator, reappearing on the lateral wall of the vagina close to the margin of the denudation, at a point as far above the appearance at the bottom of the sulcus as the starting-point on the other side of the wound. Usually not more than three or four sutures are required in the vagina on either side.

While care must be exercised when passing the needle down the side of the rectocele not to injure the rectum or allow it to appear on the vaginal surface, equally great care must be taken to cause the needle to take a deep sweep in the lateral walls of the vagina, with the idea of catching and holding up in their loose bed of tissue the relaxed fibres hanging at the sides, as insisted upon elsewhere.

If the resistance in all directions were precisely equal, the result of drawing up any one of these sutures would be to bring the three points of the triangle, made by the suture in the vaginal tissue, equally together toward the centre of the figure of the triangle; but the genius of the operation depends upon the fact that the whole resisting power lies here in one place, along the lateral wall marked * * in Fig. 280, A, where the tissues are attached to the pubic rami, and up to this place the lax tissues are lifted up and fastened.

In Fig. 280, B and C, is seen the effect of drawing up and tying these vaginal sutures, the most remarkable change observable being the fact that the wide area in front of the rectocele is almost completely disposed of by vaginal sutures alone, leaving nothing more than a relatively small depressed area brought together by one or two outside sutures.

The Crown Suture.—But two or three sutures are passed from the outside, and in simple relaxation these are never upon the skin surface, but just within the posterior commissure. The most important stitch,

called the crown suture, is entered on one side, as shown in Fig. 280, B, a short distance on either side of the centre of the line F B, and carried across the apex of the tear at its outer angle, as seen in Fig. 280, B, made to emerge on the lateral vaginal wall, transfix the point of the columna, to re-enter and reappear at the point corresponding to that of entrance. The effect of drawing this suture is to purse up the remaining exposed surface and lift the posterior margin of the denudation up to the outlet, which affords a fixed point after the tying of the vaginal sutures, as seen in Fig. 280, C. If after passing this stitch there is any pouting of the margins of the wound between the sutures, they should be very accurately approximated by one or more sutures passed superficially, and the same care should be taken to secure exact coaptation of the margins in the vagina.

The completed operation is seen in Fig. 282, where silkworm gut was used and shotted. The lower shot here clamps the crown suture, and the upper one more superficial.

The silkworm-gut sutures may be bunched together and cut long, so that the separate sutures can be grasped at once at the outlet, greatly facilitating removal. The external sutures should be removed in eight days, while the internal may remain two weeks or even longer, to be taken out after the patient has begun to go about.

The after-care of the patient is cleanliness, douching if there is discharge, and drawing the urine until she is able to pass it herself. The bowels should be opened on the third or fourth day. It is better for the patient to remain at least two weeks in bed to ensure firm union

FIG. 282.

Appearance of Parts after Emmet's Operation : A, urethra ; B, nymphæ ; C, two shotted sutures externally.

before the parts are subjected to the strain of the erect posture, but she need not at any time be confined to one posture, being allowed to change her position as often as she wishes. Opium is rarely necessary, and frequently there is not at any time the slightest sensation of pain after awakening from the anæsthetic.

To avoid the dangers of catheterization, I instruct my nurses to cleanse the meatus before passing the catheter, and keep a number of glass catheters continuously in a jar containing a weak bichloride solution. After use they are cleansed at once and dropped back into the solution, resting on some cotton in the bottom of the jar.

This operation requires judgment and experience to adapt it success-fully to all cases, but it is, in the opinion of the writer, so far superior to all other methods that no pains ought to be spared to master its peculiarities and, if possible, study a number of cases in the hands of a competent operator.

THE TREATMENT OF OVARIAN AND OF EXTRA-OVARIAN TUMORS.

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EXTRA-OVARIAN CYSTS.

THERE is a class of tumors which, while not ovarian, lie so near to the ovary as often to involve it, and usually need precisely the same treatment as cysts of that organ. In their extirpation the ovary is almost always also involved. This close anatomical relationship makes it needful to describe them in conjunction with ovarian tumors. They comprise cysts of the parovarium, or of the broad ligament, cysts of the oviducts, or Fallopian dropsy, and cysts of the terminal vesicle of the oviduct, often called the hydatid or vesicle of Morgagni.

CYSTS OF THE PAROVARIUM.

These are formed from the dropsical distension of one of the tubules of the parovarium, or organ of Rosenmüller, which lies between the folds of the broad ligament and between the ovary and the oviduct. Usually, one tubule alone is affected, and the cyst is then unilocular; but exceptional cases have been met with in which several of the tubules have become dilated, and the cyst is then bilocular or even multilocular.[1] These cysts are often called cysts of the broad ligament, and this is, perhaps, the better name.

Cysts of the broad ligament must not be confounded with those ovarian cysts which, instead of growing free in the peritoneal cavity, develop between the two layers of the peritoneum—intra-ligamentous ovarian cysts, as Garrigues very aptly calls them in his paper on the " Diagnosis of Ovarian Cysts."[2]

TREATMENT.—Since these cysts do not ordinarily affect the general health or grow to a very large size, they should, as a rule, be let alone. Whenever grounds for interference arise the cyst should be aspirated,

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[1] " Bursting Cysts of the Abdomen," by Wm. Goodell, *Trans. Am. Gyn. Soc.*, 1881, p. 231.

[2] *Am. Journ. of Obstetrics*, April, 1882, p. 394.

for sometimes after being wholly emptied it does not refill. Should, however, the fluid return, the cyst must be extirpated, and in precisely the same way as an ovarian tumor. There are dangers attending tapping which Bantock has pointed out—that of suppuration of the cavity and that of the degeneration of the cyst into malignant papilloma. When it is without a pedicle, it will have to be carefully enucleated from between the folds of the broad ligament, which then cover it. If this cannot be done, all of the cyst possible should be removed, the edges stitched to the abdominal wound, and a drainage-tube put in. This is the advice ordinarily given, but I have not yet met with a cyst of this variety which could not be removed. Were such an one to occur in my practice, I should be tempted to remove all of the cyst possible, and to close up the adherent portion in the cavity of the abdomen without resorting to a drainage-tube. The fluid secreted by a parovarian cyst is so bland that I believe no mischief would arise, always provided papillary excrescences are not present. The late Washington L. Atlee was accustomed to make merely a large circular opening in the cyst, without attempting to remove it, and Spencer Wells has recently revived the same method.[1]

Ovarian Tumors.

Life-History.—Inasmuch as the treatment of ovarian tumors depends largely upon their nature and their course, it will be well first to consider their life-history.

The natural course of an ovarian cyst is to grow rapidly, and, in about two years from the time of its discovery, to destroy life by exhaustion through the embarrassing pressure which it makes upon the organs of respiration, circulation, and nutrition. Malignant cysts grow more rapidly than the benign, while the latter will, on the other hand, occasionally remain for years in a state of quiescence. I have kept stationary cysts under observation for ten years, and others have been reported which lasted twenty years without change.

As a cyst develops it is very likely to contract adhesions to the organs with which it lies in contact. The most common adhesion is that to the omentum. Next to this is adhesion to the abdominal wall. Then will happen, more rarely, adhesions to the bowels, womb, bladder, pelvis, liver, and stomach. A loop of intestine will sometimes be found fastened to the front wall of the cyst, but usually the bowels lie packed behind the tumor. Crepitus over any portion of the cyst means that the sac-wall there is not adherent, but that it is roughened by inflam-

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[1] *Handbook of Operative Gynecology,* by Hegar and Kaltenbach, 1st Amer. ed., 1887, p. 286.

matory deposits. Yet it also shows that adhesions are taking place elsewhere, and that an operation should, therefore, not long be delayed.

Rupture of the cyst sometimes takes place, either spontaneously, through over-distension, or through violence, as by a kick, from a rude fall, or from being run over by a carriage. This accident, if the fluid happens to be bland, may be followed by a cure; but more often a violent peritonitis sets in, which carries the patient off in a few hours. From a study of 257 cases, Aronson[1] rates the fatality at 41 per cent.; but, without question, the very great majority of cases of bursting cysts of the abdomen in which this accident was followed by a cure were cysts of the parovarium, which, being thin-walled, are likely to burst, and which contain a bland, unirritating fluid. Bursting of the sac can be recognized by more or by less collapse and pain, by the disappearance of the cyst, and by the lessened size of the abdomen. If the patient does not at once succumb, excessive diuresis usually occurs. The cysts most likely of all to burst are of the colloid variety, in which the walls are usually very thin. As the jelly-like contents ooze out slowly, time is given for the peritoneum to get accustomed to their presence. Acute pain or symptoms of acute peritonitis are usually absent. But the patient's health begins to fail, as if by a chronic peritonitis, and at the operation, as I have repeatedly seen, the abdominal organs will be found covered, and even infiltrated, with colloid, which infects and poisons the whole system. The term "colloid," when applied to ovarian cysts, refers more to the gluey consistency of the contained fluid than to the question of malignancy. Yet my personal experience would lead me to say that such a cyst, when it bursts, behaves as if its contents were essentially malignant. So also is the behavior of a papillary cyst, which is peculiarly liable to be perforated by some of its exuberant growths.

It happens occasionally that the inner cyst-wall inflames, either spontaneously, or in consequence of being tapped, or from other injury. Suppuration then takes place; the contained fluid becomes fetid, and offensive gases are generated which give a tympanitic sound on percussion. There will be creeping chills, a red tongue, night-sweats, a frequent pulse, and a general rise in the temperature with evening exacerbations: in one word, all the well-known symptoms of blood-poisoning will be present in a greater or less degree. Unless the cyst be at once removed the woman will speedily die.

Ulceration of the cyst, with perforation of its wall, may also occur. The decomposing contents will then be discharged, either into the peritoneal cavity or into any viscus to which the cyst may have contracted adhesions. In this way the purulent contents of an ovarian cyst have

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[1] *Am. Journ. of Obstet.*, Nov., 1883, p. 1210.

been discharged through the bowels, the bladder, the vagina, and even into the womb through the oviducts.

Hemorrhage within the sac is an occasional accident. When it takes place the tumor rapidly enlarges, great abdominal pain is caused by this sudden stretching, the complexion grows pale, and the features become pinched; there will be collapse and all the symptoms of internal hemorrhage. If the bleeding does not stop, the patient will die in a few hours. On the other hand, if she survives the immediate danger, she is liable to succumb later to septicæmia, which arises from the decomposition of the now bloody fluid. The immediate removal of the cyst gives the woman, then, her sole chance of life.

Torsion, or twisting, of the stalk of an ovarian tumor by axial rotation is another serious complication, which leads to its strangulation and to gangrene, with consequent fatal peritonitis. The chief factors of this accident are, probably, the filling and emptying of the bladder and rectum, which may rotate an unadherent cyst with a long stalk. The symptoms of axial rotation, as carefully noted by Tait[1] and Arouson,[2] are sudden accession of severe abdominal pain and tenderness, a rapid increase in size, and incessant vomiting, the matter thrown up soon becoming green. The pulse rises, but the temperature is not always affected, and rigors are absent. Such a train of symptoms should lead at once to the abdominal section. Slow torsion of the stalk may result in its separation, and in the nourishment of the tumor by adhesions. The tumor, thus becoming parasitic through transplantation, is often quite a puzzle to the operator.

Tubo-ovarian Cysts.

Cases are occasionally reported in which an ovarian cyst has formed a communication with its oviduct. The fluid contents then may dribble away continuously from the womb into the vagina, and the woman is kept constantly wet. Far more frequently, however, the cyst enlarges up to a certain point, and then, bursting into the oviduct, rapidly empties itself and collapses. It then refills, to repeat the process over again. Or the cyst may lose only a small portion of its contents by sudden and unexpected gushes. These cysts are called tubo-ovarian cysts.

Surgical Treatment of Ovarian Tumors.

In the consideration of this subject it may be divided into the palliative treatment and the radical treatment. No regard will be paid to any special medical treatment, because all efforts in that direction have long since proved to be wholly unavailing.

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[1] *London Obstet. Trans.*, vol. xxii. p. 97.
[2] *Am. Journ. of Obstet.*, Nov., 1883, p. 1211.

Palliative Treatment.—Tapping, either by the trocar or by the aspirator, comprises the only palliative treatment of ovarian cysts; yet, as a broad rule with but few exceptions, an ovarian cyst should not be tapped. The objections to this operation are—that, slight as it may seem, it is by no means devoid of danger. Even when the smallest hollow needle of the aspirator has been used, inflammation of the cyst may follow, which will compel the immediate resort to ovariotomy, and very greatly compromise the success of this radical operation.[1] This has repeatedly happened—once in one of my own cases, in which, however, the removal of the cyst saved my patient's life. Further, the fluid of a polycyst is acrid—so much so sometimes as to irritate the hands of the operator[2]—and the escape of a few drops into the cavity of the peritoneum may set up a violent and rapidly fatal peritonitis. Then, again, a fatal hemorrhage may take place from some wounded vessel, either in the cyst-wall, or in the adherent omentum, or in the vascular pedicle which may lie spread out in front of the cyst-wall, or indeed in the abdominal wall itself, for the vessels here are often varicose from impeded circulation. In the fourth place, adhesions are very likely to form after tapping. Fifthly, innumerable daughter-cysts, which were very small before the tapping, being now relieved from pressure are liable to take on rapid growth and to make the tumor more solid; and the more solid the sac the longer the incision needed for its removal. Sixthly, in polycysts not only are the dangers attending the operation enhanced, but the cyst rapidly refills, and the woman becomes exhausted by the drain on her system. At the very best, 2 per cent. of cases of tapping in polycysts are fatal, even when performed by the most skilled specialists. Seventhly, a cyst once tapped rapidly refills, and soon needs repetitions of the operation. This drain on the system quickly tells upon the woman, and she is sometimes left too weak to have the radical operation performed. The first tapping, indeed, greatly hastens on this crisis, and it should therefore be put off as long as possible. Eighthly, a cyst emptied by tapping tends to rotate on its axis, and torsion of the pedicle may result, ending in gangrene and peritonitis. Ninthly, repeated tappings tend to convert benign papillary ingrowths into malignant. Tenthly, there is a danger of subsequent infection of the peritoneum by a papillomatous or a colloid protrusion through the cyst-puncture or by the escape into the abdominal cavity of malignant germs.[3] Finally, Lawson Tait[4] draws attention to the fact that " repeated tappings deprive the blood of some element or elements included in the infinite

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[1] *American Journ. of Obstetrics*, Nov., 1883, pp. 1169 and 1189; also *Transactions American Gynecological Society*, vol. ii., 1877, p. 270.

[2] *British Gynæcological Journ.*, May, 1887. p. 92.   [3] *Medical News*, Jan. 29, 1887.

[4] *Midland Medical Society*, *Lancet*, Feb. 18, 1882.

variety of albuminous substances found in ovarian cysts, the deficiency of which predisposes to coagulation of blood." Hence after the removal of the cyst deaths have been "due to the formation of a firm white clot which started from the point of ligature of the pedicle and slowly traversed the venous system until it reached the heart, death ensuing in from thirty to forty hours after the operation. The symptoms which precede death are swelling of the legs, rapid rise of the pulse, and its disappearance from the extremities some time before death, and breathlessness, ending in suffocation and slight delirium." He has met with several such cases of venous thrombosis starting from the pedicle, and they all occurred in patients who had been previously tapped.

There are, however, cases in which tapping cannot be dispensed with ; for instance :

1. Many women with ovarian tumors, having heard of cases of abdominal effusion or of abdominal cyst in which tapping was followed by a cure, will not submit to the radical operation until repeated tappings have proved to them the futility of the trocar.

2. Cysts of the parovarium and of the broad ligament being sometimes cured by the use of the trocar, it may be proper to try the effect of one tapping in slow-growing, unilocular, thin-walled, and flaccid cysts, which thus exhibit the chief characteristics of these extra-ovarian cysts. On this point there is a difference of opinion among leading ovariotomists. Keith advocates this practice, but Bantock and Thornton oppose it, on the ground that papillomata often exist in these cysts, and that a tapping is liable to infect the peritoneum.

3. When an ovarian cyst develops during the later months of pregnancy, it will often be best to resort to tapping in order to relieve the woman from the pressure of two growing organs and enable her to go to full term. Sometimes labor is made impossible by the presence of a cyst, which will then have to be emptied.

4. In very large tumors which by pressure interfere with the functions of the kidneys, heart, and lungs, thereby causing albuminuria, œdema, or dyspnœa, tapping is a useful prelude to ovariotomy. By the relief from pressure afforded to these organs, not only will the liability to shock be lessened, but also to hemorrhage, for vessels previously varicose will now contract to their natural calibre.

5. Tapping may be needed to give relief in pneumonia, bronchitis, typhoid fever, or in other acute diseases.

6. In cases of doubtful diagnosis, or in those in which, from malignancy, from formidable adhesions, or from other circumstances, the radical operation is deemed impracticable, tapping in the first case may clear up the diagnosis, and in the latter ones will prolong the patient's life. But it must always be borne in mind that in a few weeks the

fluid will reaccumulate and the operation will have to be repeated, rapidly exhausting the patient by the drain on her system. It is well, therefore, to put off the first tapping as long as possible.

Tapping may be performed through the abdominal wall, through the vagina, or through the rectum, but, for reasons which will presently be given, the first mode is decidedly the best.

Tapping through the Abdominal Wall.—For this operation either the aspirator may be used or else a trocar. One of the best has an elbow for a rubber-tube attachment (Fig. 283). Of the two, I should prefer the former. In aspiration, after the bladder has been emptied, the woman lies on her back, close to the side of the bedstead, with her abdomen exposed. The preferable site of puncture is in the linea alba, midway between the navel and the symphysis pubis; that is to say, at a point where the tissues, being tendinous, are most free from blood-vessels, and where the omentum is most out of the way. But if at this point the tumor feels solid, or an underlying knuckle of intestine is discovered by percussion, or the vessels look varicose, any

Fig. 283.
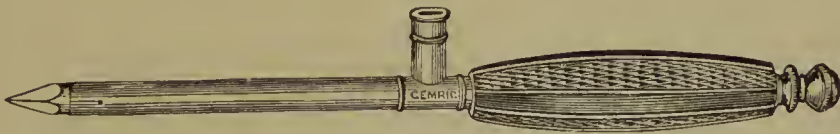
Trocar with Elbow Attachment.

other place in the abdominal wall may be selected where fluctuation is most manifest, provided it lies below the level of the navel. The reason for choosing a low site for the puncture is, that if the hollow needle be plunged in at any point above the navel, it may slip out of the cyst as the latter collapses even before it is wholly emptied. The skin is now thoroughly cleansed with soap and water, and washed with a 5 per cent. solution of carbolic acid. The painful part of the operation being the penetration of the skin, the selected place for puncture should either be frozen with the ether spray or be benumbed by a lump of ice dipped into table-salt or be rendered insensitive by the injection of a little cocaine solution. After the aspirator-jar has been exhausted of air, the hollow needle, or canula, armed with its stilette, is lubricated with carbolated oil or with vaseline, and rapidly plunged deeply into the cyst. Should the cyst not wholly collapse, the canula has probably become obstructed, and it should be cleared out by one of the blunt stilettes, which are made of different sizes to fit the different canulas. Sometimes the flaccid walls of the sac, as it becomes more and more empty, are sucked up into the end of the canula and the flow of fluid is suddenly arrested. This is recognized by a peculiar valve-like vibration communicated to the instrument, and is overcome by raising

up the end of the canula or by directing it to another part of the cyst. Should, on the other hand, other cysts present themselves, they can be emptied, without withdrawing the canula, by reintroducing the stilette and by directing its point to each cyst in succession.

When the fluid ceases to flow, the forefinger and thumb firmly compress the fold of the abdominal wall behind the canula, as it is withdrawn, so as to avoid the entrance of air, and the small puncture is covered with a piece of adhesive plaster. A pad of cotton wool is now laid over the scaphoid abdomen and a flannel binder applied. These afford a grateful feeling of support, and take away that sense of goneness which is likely to follow. To avoid all risks of inflammation the patient must keep her bed for three or four days and eat sparingly.

When a large trocar is used, the operation should be performed with antiseptic precautions. The skin should be previously incised with a lancet, and, lest air should be sucked up into the sac, the free end of the rubber tubing should touch the bottom of the bucket, so as to be always immersed in the escaping fluid. This rubber tubing acts as a siphon with great suction power, and the cyst is more rapidly emptied by a trocar than by the aspirator. Yet I cannot help believing that the latter, by its small size, is by far the safer instrument, and I always use it when a simple tapping is aimed at. Should any stubborn bleeding follow the removal of the canula, a hair-lip pin may be passed across the wound deep enough to get below the wounded vessel, and compression made by a turn or two of silk ligature around the pin. The same means are to be adopted to stop the oozing of fluid, which sometimes takes place when a cyst with colloid contents cannot be wholly emptied by the trocar. For it is highly prudent under such circumstances to stop the oozing, as some of the fluid is sure to get into the cavity of the peritoneum, with very generally fatal effects. In such a case the pin ought to include the lips of the wound in the cyst. To avoid as much as possible the escape of irritating ovarian fluid into the cavity of the abdomen, the cyst when tapped should always, if possible, be wholly emptied. This is a rule without an exception. It is, therefore, very bad practice to remove, even with the hypodermic syringe, a few drops of the fluid for microscopic examination. Several cases of death from this cause have been reported.[1] I lay stress on this point because in the earlier editions of my *Lessons in Gynæcology* I advocated this reprehensible practice.

Tapping through the Vagina.—This operation is sometimes a very tempting one to perform, when one of the cysts of a polycyst is pressing downward behind the bladder and causing dysuria. But it is by no means so safe as the suprapubic mode of tapping. The reasons for this are—(*a*) The vessels are larger and lie closer together in the

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[1] *American Journal of Obstetrics*, April, 1876, p. 146.

lower wall of the cyst near the stalk ; (*b*) in a polycyst the larger cysts, growing where they have most room, usually develop in the abdominal cavity, while the more solid portion remains below in the pelvic region ; (*c*) other organs, such as the bladder, womb, and rectum, are liable to become dislocated and to lie in the track of the trocar ; (*d*) the roof of the vagina responds to every respiratory movement of the diaphragm, and a cyst low down is not, from pelvic adhesions, so likely to collapse when tapped as one higher up ; hence the cyst is liable to act as a pair of bellows, sucking in air and expelling it. This inevitably causes suppurative inflammation, with all its attendant evils. For these reasons this mode of tapping is never resorted to, except in cases of pelvic adhesion or in those in which the cyst starts from the lower side of the broad ligament and grows downward. Even then it is done only to relieve the distress caused by the double pressure upon bladder and rectum. In such cases the aspirator should be used, as it lessens all risks. Should suppurative inflammation set in, the sac must be removed, or, if that is not practicable, it must be again emptied, the wound kept open by a drainage-tube, and the cavity thoroughly cleansed by daily injections of antiseptic fluids.

Tapping through the rectum has long ago been abandoned by the profession, as it ought to be, except in some very rare cases of atresia vaginæ. It was at one time supposed to possess advantages over the vaginal method, because the opening was not likely to close up, and the subsequent offensive discharges could be retained at will, like the other contents of the bowel. But the cavity of the sac always became distended with fecal gas, and fatal septicæmia was pretty sure to set in.

Radical Treatment.—Tapping, followed by the injection of iodine into these cysts, has sometimes been rewarded with a cure, and at one time this mode of treatment had very warm advocates. After the cyst is wholly emptied by aspiration, the action of the instrument is reversed, and from two to ten ounces of the officinal tincture of iodine are thrown in. The tincture is used of full strength, because the residual fluid in the cyst will be enough to dilute it. The cyst-wall is next kneaded, and the patient made to turn from side to side and from back to chest, so that the tincture may come in contact with every portion of the secreting surface of the cyst. The fluid is then pumped out, but all cannot be brought away ; enough usually remains behind to produce some slight constitutional disturbance. While the cannula is being withdrawn, in order to prevent the escape of any of the irritating injection into the abdominal cavity, the thumb and forefinger are made to grasp the fold of abdominal wall at the puncture-site, and to press it firmly down on to the collapsed cyst-wall. Good and lasting cures have followed such a treatment ; but since they can happen only in

monocysts, which are almost always parovarian, and not ovarian, it is probable that the mere emptying of the cyst would have done as much. In polycysts such a treatment is not to be thought of, for it would be attended with far more hazard than even the operation of ovariotomy. At the present day injections of iodine are practised only by physicians who do not operate; ovariotomists never resort to them.

Tapping, followed by enlarging the wound in the cyst, stitching its edges to those of the abdominal wound, and permanently keeping it open by tents or by one or two large drainage-tubes, has frequently been attended with success. But since extensive and prolonged suppuration must inevitably ensue, this operation has proved to be a far more dangerous one than that of ovariotomy. It should, therefore, not be resorted to excepting in cases of cysts which are too adherent to be removed. The after-treatment consists in treating the case precisely as if it were an abscess. The cyst is kept empty by draining, and sweet by such detergent agents as solutions of iodine, corrosive sublimate, carbolic acid, potassium permanganate, and the liquor sodæ chloratæ. I have had but one such case, a patient of Dr. C. A. Currie, in which the cyst was wholly adherent to all the pelvic organs and structures, and had besides a communication with the bladder. Not daring, under such circumstances, to remove it, I treated it successfully by incision, drainage, and disinfecting injections; but it was a long time before the drainage-tube could be removed and the woman be released from her bed. Cases, indeed, have occurred in which six months elapsed before the drainage-tube could be taken out and the woman pronounced well.

Another exception in favor of this operation may be made in the case of small cysts growing downward and bulging into the hind wall of the vagina. It may then be advisable to follow Noeggerath's plan. He snips open the vagina transversely behind the cervix to the length of one inch, and makes a corresponding incision in the cyst-wall. The edges of the two incisions are then stitched together, and a drainage-tube put in. Thus, the cyst is left with a free and permanent opening into the vagina, through which such antiseptic solutions as have been noted above are thrown up. In time the collapsed cyst-walls adhere to one another and cease to secrete.

Electrolysis has of late also been lauded as a sure and harmless remedy for these cysts. But a careful examination of the subject made by Mundé shows that this agent has been greatly overrated as a specific, and that it "can in no wise supplant ovariotomy."[1]

Rupture of ovarian cysts has occasionally taken place, either through over-distension or through such violence as a rude fall or an upset from a carriage. This accident, if the tumor were a monocyst or if the fluid

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[1] *Transactions American Gynecological Society*, vol. ii. p. 435.

happened to be bland, sometimes ended in a lasting cure. The hint was not thrown away, and several surgeons cut circular openings into the cyst, in order to establish a permanent communication with it and the abdominal cavity. But this practice was soon given up, because it was found that the intrusion of ovarian fluid into the serous cavity usually set up a violent and rapidly fatal peritonitis. For such an accident, when followed by inflammation, there is but one remedy—the immediate removal of the cyst by ovariotomy. Desperate as this remedy seems, it has repeatedly been followed by success. The only cyst in which it might be held warrantable to establish a communication with the abdominal cavity is that of the parovarium recurring after repeated tappings, and so bound down by adhesions or so covered by the broad ligament as to be irremovable. The fluid it contains is so limpid and bland as not ordinarily to inflame the peritoneum.

Ovariotomy.

The term "ovariotomy" comes from ὠάριον, ovary, and τομή, an incision. It is a barbarous compound, which is forced into meaning the operation for the extirpation of an ovary on account of some disease of its own structures that causes it to increase in bulk. A fibroid or a sarcomatous degeneration of this organ will sometimes happen, but cystic degeneration is by far the most common form of disease to which the ovary is liable. When both ovaries are enlarged and removed the operation is called double ovariotomy. The terms ovariotomy and oöphorectomy (ὠόφορον and ἐκτέμνο, to cut out the ovary) really mean the same thing, the latter word, indeed, being the more appropriate. But by modern usage the former is limited to the operation for the removal of an ovary greatly enlarged by some intrinsic disorder. By oöphorectomy is now meant the operation for the removal of diseased ovaries which are not larger than an orange, or of diseased ovaries and tubes, or of both ovaries for the purpose of bringing on the menopause, and thus curing diseases kept up or caused by the functional existence of those organs, while the ovaries themselves may or may not be diseased.

Before the eighteenth century the operation of ovariotomy as a radical cure had been suggested by a number of physicians, but it had never been put into practice. Later, John Hunter and John Bell both advocated the operation, but neither ventured to perform it. This honor was reserved for Ephraim McDowell, a Virginian practising in Kentucky, who had attended Bell's course of lectures delivered in Edinburgh in 1794, and had imbibed the opinions of his teacher. He returned to Kentucky in 1795, and began at once to practise his profession, but it was not until 1809 that he first met with the opportunity

for performing ovariotomy. The operation was successful, his patient having lived thirty-two years longer, and having died at the end of her seventy-eighth year. Before his own death, which occurred June 25, 1830, in the fifty-ninth year of his age, McDowell had performed 13 ovariotomies, with 8 recoveries.

In spite of McDowell's success, and in spite of a large and growing percentage of recoveries reported by Atlee, Clay, and Spencer Wells, this operation was condemned so violently by the profession that its advocates were fairly ostracised, and twenty years have hardly elapsed since it has been put upon as firm a basis as any other capital operation in surgery. "In 1843, Diffenbach, the boldest of all surgeons then living, wrote that ovariotomy was murder, and that every one who performed it should be put into the dock. Now," writes Nussbaum, "we save lives with it by the hundred, and the omission of its performance in a proper case would in these days be looked upon as culpable negligence."

The most common causes of death after ovariotomy are septicæmia or septic peritonitis, traumatic or frank peritonitis, shock, exhaustion, and hemorrhage; and it is against these foes that the operator must from the first aim all his efforts. This brings us to the consideration of the statistics of ovariotomy; but all statistics depend so much upon accidents and contingencies, as well as upon personal equations, that they are always untrustworthy. Further, some statistics do not note or detail the cases which have been declined, or the cases of exploratory incisions, or those of incomplete operations. Yet the life of a woman with an ovarian tumor is doomed if the chances of an operation are denied to her, or if the incision is limited to an exploratory one, or if the operation is an incomplete one. Her death from the tumor is virtually as assured as if she had had a fatal but complete operation performed on her. Hence, an operator with a record better than another's may not actually have saved as many lives in the hundred as the latter. "Brilliant statistics," says Hegar, "sometimes depend chiefly on the exclusion of cases which are anatomically and technically complicated, and in which the indications for operative interference are often the most imperative."[1] Another flaw in ovarian statistics is the tacit understanding among operators to consider a case as recovered if death takes place after the end of the fourth week.

Yet in no other operation does the issue depend so largely on the experience of the surgeon. Every ovariotomist finds that his success grows with the number of his cases. Of 1000 successive ovariotomies, Wells lost 34 out of the first group of 100 cases, and but 10.9 per cent. out of the last group of 100.[2] Out of his first 50 ovariotomies, Lawson

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[1] *Op. cit.*, p. 268   [2] Wells' *Abdominal Tumors*, ed. 1885, p. 64.

Tait had 19 deaths;[1] but he has since had a run of 139 cases without Listerism and without a death.[2] Keith, who began with a mortality of about 20 per cent., had a series of 100 cases with 97 recoveries. 80 of these were successive.[3] Schroeder had 17 deaths in his first 100, 18 deaths in his second 100, and 7 deaths in his fifth 100.[4] Winckel lost 65 per cent. out of his first cases, and only 12 per cent. out of his last 100 cases.[5] Martin lost 15 out of his first 52 cases, and but 3 out of his last 100.[6] Knowsley Thornton, out of his first 328 cases, lost 10.67 per cent.[7] In his last 300 cases the mortality was only 7 per cent.[8] 48 of these cases were without a death. Bantock, Skene Keith,[9] and Homans[10] had respectively 50, 49, and 38 successive cases without a death. Of my own first cases I lost about 1 in every 3. Lately I had 31 cases with but 1 death. In the last two years I have had 57 cases with 5 deaths, or a percentage of 8.7 per cent.[11] The great majority of these cases were operated on in my private hospital, where every detail of antiseptic surgery can be accurately carried out and where the patients are directly under my care.

The statistics of general hospitals are by no means so good, private or special hospitals showing to much greater advantage, even when compared with the patients' own homes. In the Vienna General Hospital during the year 1881 " ovariotomy was performed 64 times, with 38 complete recoveries, 25 deaths, and 1 woman was discharged with marasmus."[12] The statistics of two hospitals—viz. Birmingham General Hospital and Birmingham Hospital for Women—show as follows during a period from January, 1878, to September, 1885: Birmingham General Hospital—Ovariotomy, 35 cases, 11 deaths; mortality, 31.4 per cent. Birmingham Hospital for Women—Ovariotomy, 268 cases, 19 deaths; mortality, 7.1 per cent. Of total laparotomies, the former had 85 cases, with 21 deaths, or a mortality of 24.7 per cent.; the latter had 632 cases, with 49 deaths, or a mortality of 7.7 per cent.[13]

Nor are the statistics of the general practitioner much better. Taking the profession at large, out of 5153 cases of ovariotomy collected by Baum, there was a mortality of 29.13 per cent.[14] Out of 2023 cases collected by Younkin, the mortality was 27 per cent.[15] Out of 696 cases of ovariotomy performed by 96 Russian surgeons, 213 died. By opera-

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[1] *Medical Record*, Jan. 3, 1885, p. 2, and *Brit. Med. Journ.*, April 15, 1882, p. 544.
[2] *Brit. Med. Journ.*, May 15, 1886, p. 921.   [3] *Brit. Gyn. Journ.*, May, 1887, p. 24.
[4] Wells' *Abdominal Tumors*, p. 65.   [5] Winckel's *Diseases of Women*, p. 571.
[6] *Frauenkrankheiten*, 1885, p. 483.   [7] *Medical News*, Jan. 27, 1883, p. 117.
[8] Personal communication.   [9] *Trans. Brit. Gyn. Soc.*, 1887, p. 24.
[10] *Laparotomies*, p. 7.   [11] *Medical News*, Jan. 30, 1886, and Jan. 29, 1887.
[12] *Ibid.*, Dec. 30, 1882, p. 745.
[13] Price: *Journ. of Am. Med. Assoc.*, Feb. 5, 1887, p. 158.
[14] Agnew's *Surgery*, vol. ii. p. 811.
[15] *New York Medical Record*, Nov. 11, 1882, p. 560.

tive skill, by cleanliness, by wise hygienic measures, and probably by the use of antiseptic precautions, the fatality has been reduced by skilled specialists to an average lower than that of any other equally severe surgical operation; which, considering the size of the wound, the importance of the parts involved, and the delicacy of the exposed structures, is very remarkable. Yet the statistics of the best operators in the United States, while very excellent, are not quite so good as those of a few of the leading operators in Europe. This is probably due, not to less judgment or to inferior manipulative dexterity, but to two causes: 1st. Our country is a very large one, and patients at a distance from specialists delay in consulting them. 2d. Our physicians have not yet been educated up to sending their patients early, and not to tapping them. The result is that most of the cases operated on in this country have large tumors and many adhesions, while the patients themselves will usually put off the operation until reduced to the last extremity. On the other hand, patients in Europe are operated on early, while the tumor is small and the health good. For instance, Skene Keith refers to his better success as a beginner than his predecessors' in the following language: "What is the reason of the greatly-diminished number of deaths? One of the most important, and one of which little notice has been taken, is that the operations are less severe than they used to be," because they are not now postponed until they have to be done.[1] Again, Tait writes: "In cases of ovarian tumor it is very seldom necessary to use a drainage-tube, because now-a-days, that we get patients at an earlier stage, before adhesions have been secured by repeated tappings, there seldom occurs the need of drainage."[2]

This brings up the question of simple or of aseptic ovariotomy—a very important question and one not yet fully settled. The objections to Listerism are—that it is very troublesome; that it is liable to poison the patient fatally, as well as to injure the health of the operator; that it is useless, indeed merely a surgical craze; and that it is not the carbolic acid which does good, but the cleanliness enforced by this system. But there is no doubt that since the introduction of antiseptic surgery the mortality has been much lessened in every land. For instance: "In Germany, where the success of ovariotomy had not been so good as in other countries, the mortality by means of the antiseptic treatment has been reduced from 90 to 20 per cent."[3] From an analysis of all the cases of ovariotomies performed by American surgeons, "the percentage of recoveries is overwhelmingly in favor of Listerism."[4] On the other hand, Thomas Keith of Edinburgh and Tait of Birmingham, thus far the most successful of ovariotomists, have wholly abandoned

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[1] *Brit. Med. Journ.*, Feb. 5. 1887, p. 271.   [2] *Brit. Gyn. Journ.*, Aug., 1887, p. 191.
[3] Agnew's *Surgery*, vol. ii. p. 800.
[4] H. C. Bigelow: *Am. Journ. of Obstet.*, July, 1882, p 651.

Listerism. The former gentleman, indeed, claims now "to get as good results without it, and better results than any one has yet got with it."[1]

But statistics are very ticklish and untrustworthy things. For instance: During the year 1881, in the Samaritan Hospital of London, Thornton and Meredith used the carbolated spray of 1 in 40 and followed out every detail of antiseptic surgery. They had a mortality of 7 per cent. Bantock in the same institution, after gradually lessening the strength of the spray until water was alone used, finally gave even it up altogether. He, however, for purposes of cleanliness, always covered the instruments in the tray with water. The mortality of his operations showed the high rate of 20 per cent. The house committee, a body of laymen, thereupon "expressed a strong opinion against the performance of ovariotomy for the future without full antiseptic precautions."[2] In 1885 the two former gentlemen had 67 abdominal sections of all sorts, with 4 deaths—a mortality of 6 per cent., while Bantock had 43 abdominal sections, with 4 deaths—a mortality of 9 per cent.[3] In 1886, however, the tables were wholly turned, for Bantock had 25 cases of ovariotomy without a death, while Thornton had 32 cases, with 6 deaths—a mortality of 18.7 per cent.[4] For the past three years the mortality in this hospital has been 10.6 per cent. with antiseptics, and 4.2 per cent. without their use.[5]

My own practice is to adhere to every detail of antiseptic surgery but the spray, which I have abandoned in my private hospital and use only in the wards of the general hospital—that of the University—to which I am attached; and I fully agree with Bigelow that "it would be a grave error to abandon a practice which has achieved brilliant results until something shall be brought forth which shall be as thoroughly protective, and in the use of which there may be no possible dangers. Time alone can demonstrate satisfactorily the relative values of Listerism and of perfect cleanliness without Listerism. The results of a large number of cases in which cleanliness and attention to detail have alone been used are the only criteria upon which we can strike a judicial balance."[6]

Contraindications for Ovariotomy.—An operation should be declined in far-advanced tuberculosis, in cancer of the ovary or of any other part of the body, in grave structural lesions of any of the vital organs, in ascites if caused by disease of the heart, of the liver, or of the kidney, in gastric ulcer, or in any serious disease of the alimentary canal. Extensive adhesions should not count as contraindications, nor should

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[1] *Brit. Med. Journ.*, May 27, p. 796. [2] *Ibid.*, May 20, 1882, p. 747.

[3] W. P. Manton: *Transactions Michigan State Medical Society*, for 1886.

[4] *British Medical Journal*, February 12, 1887, p. 334.

[5] *Trans. Brit. Gyn. Soc.*, May, 1887, p. 19.

[6] *American Journal of Obstetrics*, July, 1882, p. 651.

age, since young children and very old women have been successfully operated on. Albuminuria is often due to the pressure of the tumor on the kidneys, and, unless it existed before the appearance of the tumor, or it is positively known to be caused by Bright's disease, it should not preclude the operation; but chloroform should then be used as the anæsthetic. Extreme debility dependent upon the ovarian disease makes the prognosis grave, but it should not prevent a resort to ovariotomy. I have indeed had several recoveries when the patient was so reduced in strength as to make it a very anxious and difficult task to keep her from dying on the table.

Indications for Ovariotomy.—This operation should not, as a rule, be performed, especially by inexperienced surgeons, when the cyst has first been discovered, but when it is found to be steadily increasing in size. My reason for this conservative advice is that a certain number of abdominal cysts—especially when of parovarian origin—stop growing after reaching a moderate size, and give no further trouble. I have had patients under observation for years who during that time have carried such quiescent cysts, and were not conscious of their existence. When, however, a woman broods over her condition and is anxious to have the tumor removed, the operation should be performed as soon as possible. As a rule, the earlier a growing cyst is removed the better, because, being smaller and usually without adhesions, it is then more safely removed, and because, although benign in the onset, it tends in time to take on malignant degeneration. But the technical difficulties in the removal of small tumors are greater. The pedicle is often not well developed, and if the tumor be adherent the tense abdominal walls prevent easy manipulation or inspection.

Again, when an ovarian cyst is complicated with pregnancy, it is better to perform the operation in the first half of the period of gestation; for in the last half the broad ligaments receive a large supply of blood, all the pelvic vessels become varicose, and the structures forming the pedicle are turgid and vascular. Pregnancy is indeed no bar to the operation, the prognosis being favorable both to the mother and to the child. Schroeder and Olshausen performed 21 ovariotomies in pregnant women, with only 2 deaths.[1]

When septic peritonitis sets in; when the contents of the sac become purulent, as they sometimes do, either spontaneously or after an unprotected tapping; when the cyst bursts and serious symptoms arise; when torsion of the pedicle occurs; or when a free hemorrhage into the sac takes place,—the radical operation should unhesitatingly be performed, and that without any delay.

Preparation of the Patient for the Operation.—The operation having been decided upon, every precaution must be taken to ensure a favor-

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[1] *British Medical Journal*, Dec., 1880, p. 1027.

able result. The patient should avoid all exposure to contagious or to zymotic diseases, and she should be put in the very best condition of health possible under the circumstances. If the kidneys be inactive and the urine highly concentrated, depositing mixed urates in abundance, it will be well for the patient to make use of warm baths and to take saline cathartics in quantities sufficient to secure a daily action of the bowels. The alkaline carbonates, largely diluted, will also prove beneficial, and so will also the effervescent citrate of lithia. Sometimes, and especially when anasarca and œdema of the legs occur, it may be advisable to relieve the pressure-congestion of the kidneys by a preliminary tapping. Other organs will also be relieved, and valuable time for the action of medicines is often gained by emptying the cyst. Tonics, iron in the form of Basham's mixture, a generous diet, and fresh air may be needed. A trip to the seashore or to the country will often do much good in preparing a broken-down patient for the operation. If the patient comes from a malarial district, from twenty to thirty grains of quinia should be given during the twenty-four hours for two or three days before the operation, and ten grains a few hours before the time of the operation. If this be not done, a severe explosion of malarial fever after the operation may put the patient's life in jeopardy.

An operation of election should not be undertaken during a monthly period. It should be performed either about ten days before one or about a week after one. The very best time is midway between two fluxes. When, however, through some lesion or some accident, immediate relief is demanded, no regard whatever should be paid to the factor of menstruation. Some surgeons operate, indeed, in any case whether the woman is menstruating or not, and profess to find no difference in the result.[1] I have done so repeatedly, and with no bad results.[2]

For several days before the operation the bowels should be kept open, and the diet should consist largely of bread and soup, or of milk, eggs, and rice, or of wholesome and easily-digested food. It is well also for the patient to keep in bed or in the recumbent posture for two or three days before the operation. It will accustom her to confinement, and will teach her how to pass her water while lying on her back; which many women cannot do without a preliminary education. On the day preceding that of the operation the upper portion of the pubic hair should be cut off and the abdomen, if hairy, shaved. In the evening the patient takes a warm soap-bath, and is washed perfectly clean by her nurse, who must be an experienced woman, able to pass the

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[1] T. Savage: *Brit. Med. Journ.,* April 14, 1883, p. 712; also, H. P. C. Wilson: *Maryland Med. Journ.,* Dec. 17, 1887.

[2] *Medical News,* January 29, 1887.

catheter and to take the temperature. She then puts on clean clothing and goes to bed, where she stays until the hour fixed upon for the operation. To ensure sleep in nervous women, I am in the habit of giving at bedtime thirty grains of potassium bromide. Early in the morning of the day preceding that of the operation a dose of castor oil is administered, and it is much more easily swallowed if disguised in some vehicle and brought to the patient without any previous warning. When oil cannot be taken, I give, at bedtime of the previous evening, and in one dose, two compound cathartic and two Lady Webster pills. On the morning of the day of the operation, to avoid ether-vomiting, the breakfast should consist merely of one piece of dry toast and a cup of tea, or of a cup of beef-tea, or of a goblet of milk, and afterward she must eat nothing more. To calm the nerves another thirty-grain dose of potassium bromide may be given, especially if the woman be at all agitated. It is well also now to open the lower bowel by an enema, and to wash out and disinfect the vagina by a douche of a solution of 1 : 2000 of corrosive sublimate.

My favorite hour for operating is nine o'clock in the morning, when no food whatever will be needed beforehand, and when the physician and his assistants will not have made any professional visits beforehand. Another very good time for operating is from noon to two o'clock in the afternoon, for by that time the light breakfast will have been digested. At the hour fixed upon for the operation the woman puts on a flannel sacque, warm stockings and drawers, and empties her bladder.

The bedstead on which the woman is to lie after the operation should have a horse-hair mattress, and should be wide enough to permit her attendants to move her on a draw-sheet from one side of it to the other. I formerly placed my patients on narrow single bedsteads, so that they could be reached and be waited upon equally well from either side; but I found that an unchangeable position on the back soon became intolerably irksome. Next, indeed, to the thirst following the operation, my patients complain mostly of the supine posture which they are compelled to assume.

The room in which the operation is to take place ought to be a separate one, so that the lady can be etherized in her sleeping-room, and may not be unnerved by witnessing the needful preparations. Several days beforehand the carpet of the operating-room should be taken up and the curtains taken down. Every useless piece of furniture should be removed, the closets and bureau-drawers emptied, and the whole room thoroughly cleansed and ventilated. Several hours before the time of the operation this room ought to be heated to a temperature of 75°, and the air disinfected and made moist by a solution of carbolic acid kept boiling in a dish on the stove or over an alcohol lamp.

Let me here say that, if possible, this operation should not be performed within the walls of a crowded general hospital nor in unhealthy localities, but, as statistics well show, in private houses, or, far preferably, in small special hospitals.

Articles Needed for the Operation.—The following articles should be provided by some member of the patient's family. Following the example of the late Washington L. Atlee, I have a printed list of them, which is sent to the family physician some days before the operation :

One yard of rubber plaster ;
Two rolls of raw cotton, made aseptic by being baked in the range-oven just before the operation ;
Two yards and a half of fine white flannel, for two binders ;
Two pounds of the best ether ;
Two gallons of a 5 per cent. solution of the best carbolic acid, made at least two days beforehand ;
Four ounces of Monsel's solution of iron ;
An ounce of iodoform ;
Twelve ounces of undiluted alcohol for the spray-producer ;
Some old whiskey, with cup, spoon, and sugar ;
A nail-brush, basin, and soap ;
A pin-cushion, with large pins and safety-pins ;
Two kitchen tables or two dressing-tables on which to operate ; [1]
One small stand for the spray-producer ;
One small table for the basins and sponges ;
One chair without a back for a bucket of hot water ;
Two new tin basins and one tin cup ;
A new bucket and a jug of hot water ;
Two kettles of boiling water, ready on the range ;
Pure cold water in abundance, that has been previously boiled ;
A small tub and an empty bucket ;
Six bottles filled with hot water and tightly corked ;
An empty wine-bottle for the aspirator ;
A rubber ice-cap, or two pig's bladders, for holding ice ;
A rubber cloth one yard and a quarter square, with an oval hole in the centre six inches wide and eight long ;
Two kitchen aprons for the operator and his assistant ;
One clean blanket for the patient's lower extremities ;
Two large platters or two meat-dishes, to be used as trays for the instruments ; [2]
Clean towels, clean sheets, clean blankets, clean comfortables, and clean pillows.

Instruments.—In simple cases very few instruments are needed, but, as one never knows beforehand what complications may be met with, it is best always to be prepared for every emergency. One must there-

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[1] Or an operating-table can be made expressly for the occasion. It should be 22 inches wide, 31 inches high, and 6 feet long.

[2] These platters are usually too shallow to hold a solution of carbolic acid deep enough to cover the bulkier instruments. It would, therefore, be well to have a tin tray made especially for the purpose, measuring 19 inches long, 12 wide, and 3 deep ; or a nest of smaller trays can be carried in the operator's bag.

fore have on hand every instrument likely to be wanted in the most formidable operation. The following list comprises all the instruments and other articles that I carry with me in my operating bag; but it will not suit every surgeon, who will, after a few operations, choose his own favorite instruments :

One steam spray-producer, which will work two hours;
Assorted silk ligatures on glass spools;
Lister's antiseptic gauze or salicylated cotton;
Two dozen straight surgeon's needles;
Assorted needles with varying curves;
Two aneurismal needles for transfixing pedicles;
One needle-holder;
One hypodermic syringe;
Two dozen assorted pressure-forceps;
One uterine tenaculum;
Assorted hare-lip pins and acupressure needles;
One grooved director;
Two scalpels;
Baker-Brown's cautery clamp;
Ten fine surgeon's sponges of different sizes;
Two long and flat sponges;
One wire éeraseur;
One wire clamp or Koeberlé's serre-nœud;
Paquelin's cautery or three cautery-irons;
One Wells' (Fig. 102) or Hodge's (Fig. 103) trocar with rubber tubing;
One aspirator;
Two Nélaton's cyst-forceps;
One straight pair of scissors;
One pair of scissors curved on the flat;
One right-angled pair of scissors;
Allis's improved ether-inhaler;
One flexible male catheter;
Three glass drainage-tubes (Keith's) of different sizes and lengths, together with the rubber sheeting and the sponge used with them.

The twenty-four needles should be threaded, two on one thread of fine silk eighteen inches long—viz. No. 1 or 2, of an excellent quality furnished by Messrs. J. H. Gemrig & Son of Philadelphia. To keep

FIG. 284.
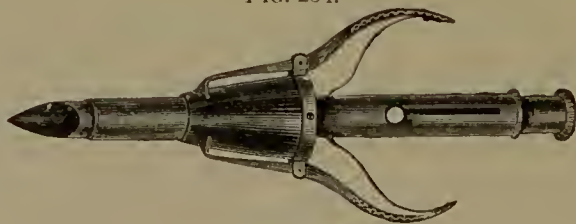
Wells' Trocar.

these threads from becoming tangled, they are rolled up in a strip of muslin gauze, each pair of two needles with their thread being covered up by one fold of the gauze. The two aneurismal needles should also

Fig. 285.
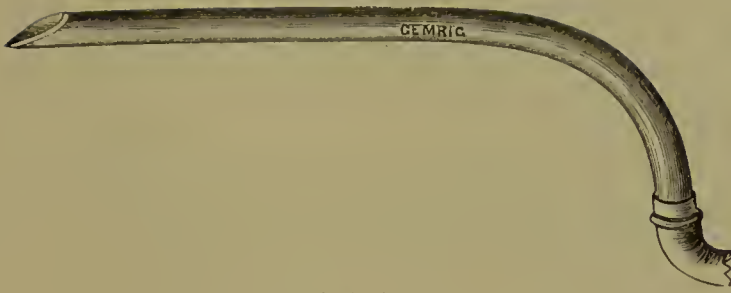
Hodge's Trocar.

be threaded, but with stouter thread (No. 3), fully two feet long. All these armed needles should be put into a 5 per cent. solution of carbolic acid for several hours before the operation. Assorted needles of varying curves come occasionally into use, and it is always well to have several very fine needles on hand, together with the finest Chinese silk, in order to close a wounded viscus, such as the bladder or the bowels.

As an aid to the memory it is well to have, invariably at every operation, the same number of sponges and the same number of pressure-forceps, for these are the only articles likely to be left behind and closed up in the abdominal cavity. The cautery-irons should be wedge-shaped; the iron spreader used by apothecaries in making plasters forms an excellent substitute. In my hands the best pressure-forceps, or catch-forceps, is

Fig. 286.

Koeberlé's Pressure-Forceps.

Koeberlé's (Fig. 286). Its pointed beak catches the tissues far better than that of Wells' forceps, which looks like a crocodile's muzzle. The ordinary hæmostatic bulldog clips, or the serres-fines, must on no account be used, because, if they should lose their hold and drop into the abdominal cavity, they would be too small to be readily discovered, and might indeed be hopelessly lost in the coils of the bowels. Long strings attached to each one would, however, overcome this objection. Péan's pressure-forceps with broad surfaces are often of great use, and a few should be on hand (Fig. 287).

The ten sponges must be of the best quality and about the size of one's fist. Two of them should be flat, long, and thin, such as are called by the trade " potter's sponges." They are also termed Zymoca

Fig. 287.
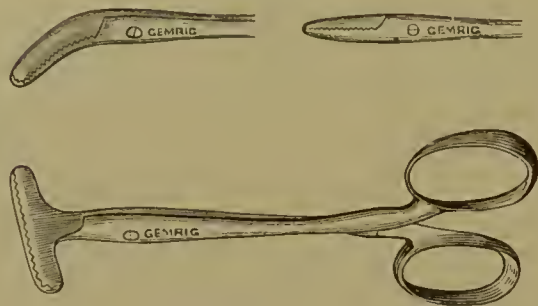
Péan's Pressure-Forceps.

flat sponges or "elephant's ears." When first bought sponges almost
always contain sand. To rid them of this, they are beaten, then soaked
for twenty-four hours in a 3 per cent. solution of muriatic acid, and
afterward washed out in clear running water. Sponges should never
be put into boiling water, which destroys their elasticity, shrivels them
up, and spoils them. After every operation the sponges should be
thoroughly cleansed in cold water, and immersed for forty-eight hours
in a solution of washing soda (sodii carbonas) containing four ounces to
the gallon of water. They are then rinsed out in running water, and
placed in a 5 per cent. solution of carbolic acid. At the end of a week
they are to be taken out and hung up in a bag. Instead of a solution
of soda, some prefer an 8 per cent. solution of sulphurous acid, in which
the sponges are soaked for from two to four hours. This bleaches the
sponges, but it does not cleanse them so well as the alkaline solution.

Only two assistants are needed, and they and the surgeon should take
a soap-bath, and not see, on that morning, any patient ill from a zymotic
or a contagious disease. Their clothes should also be scrupulously clean.
To ensure still further protection, each one takes off his coat, waistcoat,
and neck-tie, if they are of a material that cannot be washed. The
nurse must also wear clean clothing that can be washed. A few
bystanders may be permitted, but they should wear clean clothing, and
should also take off their coats and waistcoats. They should also be
cautioned not to visit before the operation any case of contagious
disease.

Preliminary Preparations.—Upon arriving at the patient's house the
surgeon, together with his assistants and the nurse, proceeds at once to
get everything in readiness. The two tables may be arranged in the form
of a T, covered with several thicknesses of quilts, and with a pillow on
the cross-table. When the tables are thus arranged, a third one will be
needed for the instruments and the spray-producer. In order to econo-
mize room and furniture, I am in the habit of putting one table at right
angles to the other, like the letter L reversed—viz. with its short arm to
the left instead of to the right, thus: ⌐. The woman lies on the long arm

of the ⌐, with her feet directed to the short arm, and on the projecting and free portion of the table forming the short arm are placed the tray of instruments and the spray-producer. As it takes time to get up steam in the necessarily large spray-producer, hot water should be poured into the boiler, and it should be one of the first things attended to. In order not to chill the patient, the spray solution of carbolic acid should also be heated before it is used. At present, however, when using the spray —which I do only in the hospital of the University, and not in my private hospital—I do not turn it on to the wound, but I start it in the operating-room two hours beforehand, and during the operation direct it away from the patient. The edges of the oval hole in the rubber sheet are next smeared with collodion, or with some adhesive preparation ; but a plaster suitable, in our climate, for all seasons of the year is not easy to devise. Keith's formula is the following, but it will not always stick :

R̞. Emplastri saponis,   ℥iv ;
Emplastri resinæ,   ℥iij ;
Olei olivæ opt.,   ℥j.   M.

The formula used at the Samaritan Hospital of London is that of the emplastrum resinæ B. P.—viz. sixteen parts of lead plaster, *melted at a low temperature,* and then mixed with two parts of resin and one part of curd soap. The mass is stirred until the ingredients are thoroughly mixed, and 2 per cent. of melted carbolic-acid crystals is added as this is being done. If the lead plaster is melted at too great a heat, the compound will not be of sufficient consistence.[1] After many trials, Dr. W. D. Robinson of Philadelphia has succeeded in making for me a very good plaster according to the following formula :

R̞. Emplastri saponis,   ℥ij ;
Resinæ,   ʒvj ;
Terebinthinæ albæ,   ʒij.   M.

I must, however, add that I now very rarely use this rubber cloth, because it is not essential and it is troublesome to manage.

Not all the instruments in one's bag, but only those likely to be needed, are now counted and placed in the tray or in the platters, and covered over with boiling water, to which in a few minutes is added the same quantity of a 5 per cent. solution of carbolic acid. The best plan would perhaps be to pour into the tray a boiling 2.5 per cent. solution of carbolic acid. In the same tray is also laid the roll of gauze containing the threaded needles. By its side on the table, and within easy reach, is placed a small bottle filled with

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[1] Doran's *Gynecological Operations,* 1st Amer. ed., p. 87.

a 5 per cent. carbolated solution in which are kept four small glass spools of Nos. 1, 2, 3, and 4 silk, the last being used for the pedicle. The adhesive or rubber plaster is cut into strips that will go around three-quarters of the body, to allow for tympanites, and the antiseptic dressing put in readiness. The trocar, with tubing attached, is hung on a nail near by. The sponges are carefully counted and placed in one of two basins arranged side by side on a table to the left of the patient. The other basin is one-third filled with a 5 per cent. solution of carbolic acid, which later on is reduced by the addition of pure hot water to a strength of 2.5 per cent. On a chair is placed a bucket of clean warm water.

Let me here say, once for all, that throughout the operation the assistant who looks after the sponges attends to them in the following way: Every soiled sponge returned to him is first cleansed in the bucket of warm water, next rinsed in the carbolated solution, then squeezed out and placed in the empty basin. This sequence must be rigidly observed, because, if the soiled sponge be plunged first in the carbolated water, the blood and serum which it contains will at once coagulate in its meshes, and become liable to be dislodged in the abdominal cavity as foreign bodies. Some surgeons use the carbolated solution for their instruments, and a 1 : 10,000 solution of corrosive sublimate for their sponges. A. Martin uses the latter for both sponges and instruments.

Meanwhile, the woman, in another room, has been inhaling the anæsthetic—the best being, in my opinion, the æther fortior of our leading manufacturing druggists. It should be administered by Allis' inhaler, which largely dilutes it with air. Chloroform is the better anæsthetic whenever the woman has a renal or a bronchial affection, or perhaps whenever she is old. In the aged ether tends to produce œdema of the lungs or bronchial irritation. Wells and Thornton employ the bichloride of methylene; Keith uses pure ether; Bantock resorts to chloroform; and Tait to a mixture of two parts of ether and one of chloroform, given by means of Clover's apparatus.[1] When the patient is wholly unconscious, she is carried into the operating-room and laid on the table. To this table she is strapped down by a belt over her thighs, and her hands are also secured to the same belt. Her legs are wrapped in warm blankets, and her clothes are drawn up out of the way. Her chest and body are then covered by the rubber sheet, but the edges of its oval opening are made to adhere to the skin, from just above the navel to the pubic hair, thus exposing only a limited portion of the abdomen. After this, the spray is turned on and directed toward the abdomen, unless the operator has already used it for disinfecting the room, when it may be directed away from the patient. The 5 per cent. solution of carbolic acid in the tray and in the basins is diluted with

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[1] *The Medical Record*, Jan. 3, 1885, p. 2.

hot water down to 2.5 per cent. The operator and his assistants now take off their rings, and cleanse their hands very carefully with carbolated soap and a nail-brush. They may clean and pare their nails with a penknife before the use of the nail-brush, but not after, because the knife not only does not remove all the dirt, but it loosens up that which remains. Arranging themselves in their places, the operator stands to the right of the woman, the assistant who gives the ether is at her head, while the other, who attends to the sponges, takes his place near the basins on the left side of the patient. The nurse holds herself in readiness to hand towels when called for, and especially to see that a third basin always contains warm water, so that at any stage of the operation the surgeon can wash his hands without delay.

The Abdominal Incision.—When everything is ready, the door is locked, and the exposed portion of the abdomen washed, first with ether, then with a 1 : 1000 solution of corrosive sublimate. An incision, about three inches in length, is made with a free hand, and not by nicks, in the median line below the navel, where the blood-vessels are few in number. It should end about one inch and a half above the pubes; that is to say, low enough for the pedicle to be easily reached, but high enough to avoid cutting the fold of peritoneum reflected from the bladder to the abdominal wall. The brown line running below the navel is the surface guide, but in small tumors, after cutting through the skin and fat, one cannot always hit the linea alba beneath. Below the umbilicus the recti muscles lie close together, and there is virtually no linea alba. Above the navel the muscles diverge, and a true linea alba exists there. When the cyst is large, the recti muscles have become separated from one another, and there is no difficulty in keeping within the wide tendinous interspace. But when the cyst is small, the linea alba is, as its name indicates, a mere line, and the knife will often go astray into the anterior sheath of one of the recti muscles. The red muscular fibres ponting out of the opening will be the danger-signal of one's having got off the track into more vascular regions. To recover it, a probe is passed in across the muscle to the right and to the left, and the nearest point of arrest will note the linea alba. The disadvantages arising from a wandering from the linea alba are—that the sheath of the rectus muscle being cut open, or the muscle itself being wounded, there results hemorrhage; that the wound is more jagged, and therefore less easily coaptated; that suppuration in the suture-tracts is more liable to take place; and, finally, that in cases of small cysts with but little abdominal enlargement a spasmodic contraction of the wounded muscle is very likely to embarrass the operator both in removing the cyst and in introducing the sutures. Yet I am by no means sure that the subsequent cicatrix would not be firmer, and less liable to thin out into a ventral hernia, were the recti muscles incised instead of being avoided.

Again, one cannot on a grooved director cut canonically through the different layers of tissue described with so much precision in the text-books. On the contrary, a director is not needed, for all that one needs to know, is when the knife is approaching the peritoneum. An excellent landmark is the thin layer of fat overlying the peritoneum. So, after pinching up the abdominal wall to estimate its thickness, the surgeon can boldly cut down through the skin and its underlying fat, but somewhat cautiously through the aponeurotic structures, until the second layer of fat is reached. Practically, therefore, he need regard but the following layers: skin with its underlying fat, the intermediate tendinous or muscular structures, the præperitoneal fat, and the peritoneum.

Before the abdominal cavity is opened all bleeding is stopped by the use of pressure-forceps, of which one dozen will sometimes dangle from the wound. Should the tumor be malignant or adherent to the abdominal wall, the bleeding will be more free, and the præperitoneal fat will be pink instead of yellow. This fat is teased apart, or, if redundant, it is caught up by a forceps and snipped off. When the hemorrhage has been wholly stayed, and not until then, the peritoneum is hooked up by a delicate uterine tenaculum and nicked open, or else it is caught by two pressure-forceps at opposite points in the centre of the wound, raised up, and nicked open between them. On a broad grooved director or on the finger this opening is slit up for a distance of about two inches, either by a right-angled pair of scissors or by a probe-pointed bistoury. A little serum usually escapes, and the nacreous wall of the cyst comes into view. This is called an exploratory incision, for by it the diagnosis is confirmed, the presence of adhesions ascertained, and the possibility of completing the operation determined. When it has been decided to go on with the operation, more working room will be needed, and the wound is therefore enlarged by the scissors, two fingers being used as a guide to prevent injury to the omentum or to any chance knuckle of bowel that may lie in the way. The size of the incision will depend upon the character of the cyst and on the number of its adhesions. Hence it may range from a length of three inches to the distance from ensiform cartilage to symphysis pubis. An incision contained between the umbilicus and symphysis pubis is technically called a short incision, and one extended above the umbilicus a long incision. Should it be found needful to prolong the wound to a point above the umbilicus, the incision is usually carried to the left of the navel and brought back in a curved line to the linea alba. This is done to avoid the round ligament of the liver and its vessels, which come in there from the right side. Keith, however, cuts directly through the navel; and I find this straight incision to be superior in every respect to the curved one. Other things being equal, the short incision is safer than the long one; but it is a good rule to have an

opening large enough for easy manipulation and for the easy with-
drawal of the cyst. For instance, a large monocyst without adhe-
sions, after being emptied, can, like a wet bag, be pulled out, hand
over hand, through a very small opening, whereas a much smaller
polycyst, which cannot be wholly emptied and which is more or less
adherent, will need a long incision. I once removed an oligo-cyst,
weighing one hundred and twelve pounds, through an incision barely
admitting my hand; while I had to open the abdominal cavity from en-
siform cartilage to symphysis pubis in order to remove a solid ovarian
fibroid tumor weighing but eighteen pounds. Both patients recovered,
but the chances were, of course, more against the woman with the long
incision. To avoid the escape into the abdominal cavity of any blood
from the wound, and to prevent the soiling of the operator's hands, a
clean napkin wetted with the carbolated water may be doubled over
each edge of the incision.

Whenever the cyst-wall in the line of the incision is glued by adhe-
sions to the parietal peritoneum, the latter is liable to be mistaken for
the former, and accordingly to be stripped off from the abdominal wall.
Although I have always been very careful not to make this mistake,
yet in my two hundred and seventh case of ovariotomy I stripped off
the peritoneum for about a hand's breadth from the whole edge of the
wound before I discovered what was being done. Fortunately, the
patient recovered. To avoid this very serious error, either proceed
with the cutting until the cyst-wall unmistakably comes into view or
is opened, or else extend the incision upward until a point is reached
where the cyst is free from adhesions. Adhesions binding the cyst to
the abdominal wall are of importance only from the troublesome oozing
their rupture often gives rise to. To lessen this risk, they are to be
sundered by sponge-pressure or by the fingers whenever possible.
Should the scissors be used, the adhesion bands must be snipped close
to the surface of the cyst, and not to that of the abdominal wall. Thus,
a free end is gained, which may, if needful, be subsequently tied, or in
which the dangling blood-vessels may the more readily constringe. All
thick and long bands of adhesion should be tied in two places, and be
divided between the ligatures. These ligatures should consist either of
very fine silk or of gut. For isolated vessels the latter are the better
ones, but the silk is more suitable for tying en masse a group of bleed-
ing vessels or for pursing up an oozing surface by an in-and-out stitch.
A very important rule, on the observance of which one's success greatly
depends, is, never to let a bleeding point or an oozing surface get out
of sight. It must either be ligatured at once, or else caught by pres-
sure-forceps and tied later if needful. If the delicate omental apron
be found glued to the cyst, it should be carefully detached with as little
tearing and splitting as possible, for each shred will bleed, and so will

the fork of the split.   It should then be turned out of the abdominal cavity on a clean napkin wetted with the carbolated solution.   If its bleeding vessels be few, each one may be tied with gut; but if they are many, the torn portion of the omentum should be tied en masse or in sections, and the ligatures cut off close to the knot.   No rent should be left in the omentum into which a knuckle of intestine might enter and be strangled.   It should either be tied off or sewed up.   All shreds and ragged ends must be trimmed off, and the omentum is then returned to the peritoneal cavity.

Tapping and Removing the Cyst.—When all the adhesions within reach, and those that do not demand great force, have been severed, it will be time to tap the cyst.   This should be done with a large-sized trocar, such as Wells', which is furnished with spring teeth to prevent it from slipping out of the cyst.   Any trocar will do, provided it has a large bore, so that the vent may be free, and that none of the acrid fluid can escape along its side into the abdominal cavity.   In order to save time, Martin and other German operators do not use a trocar.   They incise the cyst, and try, by turning the woman on her side, by lateral pressure, and by traction on the cyst-wall, which then fills up the abdominal incision, to direct the contents externally.   Frequently, however, some of the fluid escapes into the abdominal cavity, but they contend that if antiseptic precautions are taken no harm accrues.[1]   Although dissenting from this opinion, I must confess to having had some of the contents of the cyst escape repeatedly into the abdominal cavity without doing any harm whatever.   But then I always irrigate the cavity and wash it out with an abundance of pure warm water.   Drs. Lane and Macan report a case in which they became affected with boils and abscesses on their hands after removing an ovarian cyst.   Yet, although "a considerable quantity of the fluid got into the peritoneal cavity," the woman got well.[2]

Always tap at the upper angle of the wound, because as the cyst collapses the trocar is drawn downward toward the lower angle. Hence, were the trocar entered low down, it could not travel with the collapsing cyst, which would therefore slip off.   While the fluid is flowing, flat sponges should be packed in between the abdominal wall and the cyst, and the edges of the incision should be pressed firmly against them, so that the peritoneal cavity may not receive a single drop of that which frequently escapes along the side of the trocar.   To avoid this accident—which, without being a very serious one, is yet not to be invited—some ovariotomists, before tapping, turn the woman well over on her belly and over the edge of the table; but this is liable to cause a protrusion of the bowels; which is, in fact, a more dangerous accident than the entrance of some of the fluid into

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[1] *Berlin. klin. Wochenschr.*, 1883, No. 10.   [2] *Brit. Gyn. Journ.*, May, 1887, p. 92.

the abdomen. Rosenbach, indeed, reports that during the extraction of biliary calculi through an abdominal incision a cure resulted, although several calculi were lost in the peritoneal cavity.[1] Should the mother-cyst not collapse, on account of its containing a few other large cysts, the point of the trocar, without being withdrawn, can be made to enter each one. But if the daughter-cysts are many and small, the trocar is withdrawn, the opening enlarged, its edge seized by several pressure-forceps, and the hand introduced to break up these cysts.

Before this hand can again be used for separating adhesions it must be carefully cleansed with soap, and dipped into the carbolated solution in the tray of instruments.

The empty cyst is next gently pulled out through the abdominal wound. It is, however, so slippery that this cannot ordinarily be done with the hands alone. A strong forceps with a firm grip is needed, and one of the best is Nélaton's. While the cyst is being withdrawn the bowels are sheltered from the air and from the spray, if directed on the wound, by one large flat sponge, and the abdominal cavity must also be packed with smaller ones at every exposed point; and one of them should always be placed between the womb and the bladder.

In the majority of cases there is not much difficulty in freeing the cyst from its ordinary attachments and in reaching its pedicle. But should adhesions bind the cyst to the adjacent viscera, matters will not go on so smoothly. Such adhesions to bladder, liver, bowels, or to other important organs sometimes present difficulties which are insur-mountable. The problem here is to sever these bands of adhesion without injuring the viscera to which they are attached. If the adhe-sions are recent, they can usually be sponged off, the sponge at the same time absorbing the blood. When these adhesions are numerous or very firm, much advantage will be gained by having the assistant put his hand within the cyst and stretch its wall, while the operator severs the adhesions over it. By this means the adhesions can be better broken off close to the cyst, which is the all-important course to pursue in vis-ceral attachments. Sometimes it will be needful to peel off the outer and non-secreting layers of the cyst and leave them behind—sometimes to cut off the adherent portion of the cyst and scrape off or strip off its secreting surface. Whenever the stalk of the tumor can be reached before all the adhesions are severed, it is well to catch it with one or two pressure-forceps, or even to tie it and cut it off between two liga-tures, like the umbilical cord. This will prevent bleeding from the torn surfaces of the cyst. When the cyst is closely adherent to the edges of the abdominal incision, either extend the wound upward until a free point is reached, and work downward on the adhesions, or else cut into the cyst, empty it, and seize with strong forceps its inner sur-

[1] *Medical News,* Feb. 3, 1883, p. 130.

face just beyond where the adhesions begin. The sac is then inverted by traction, which will break up its adhesions to the abdominal wall, the last portions to be freed being those attached to the edges of the incision. This prevents the stripping off of the peritoneum. Should the appendix vermiformis be so adherent to the cyst as not to be detached, it must be ligated in two places, between which it is to be cut, in order that its contents may not escape into the abdominal cavity. The fecal plug in each distal end should also be carefully squeezed out. Double ovarian cysts sometimes fuse together, and, rupturing at the point of fusion, form apparently one cyst. Such a cyst will have two pedicles, and will be very puzzling to the inexperienced operator. As the cyst is being detached, pack sponges in every gap left behind in the abdominal cavity.

Treatment of the Pedicle.—When the cyst has been freed from its attachments and turned out of the wound, the very important question comes up of the treatment of the stalk or pedicle. Shall it be secured by a clamp? shall it be burned off by the actual cautery? or shall it be tied, cut off, and dropped back? The first is called the extra-peritoneal method; the others, the intra-peritoneal. For many years the clamp claimed the most advocates, but it has lost ground on account of possessing the following disadvantages : By keeping the wound open it prevents a strictly antiseptic treatment ; the stalk sometimes sloughs below the line of constriction, and conveys putrilage into the abdominal cavity ; the stalk always becomes united to the abdominal wall ; hence, when it is short, the womb is dislocated or it is too much dragged upon. Then, again, in one-third of the cases the oviduct has a trick of remaining open, and the woman will menstruate indefinitely from the abdominal cicatrix. This is owing to the fact that the clamped portion sloughs off too early for a firm plug of cicatricial tissue to be formed, and the oviduct is therefore liable to stay open. In my first case of ovariotomy this happened, and one year later the cicatrix degenerated into a malignant growth, which destroyed the life of my patient. It is, however, probable that in this instance the cystic disease of the ovary was malignant, although the sac did not look so at the time of its removal. Another disadvantage arising from the use of the clamp is the subsequent weakness of the cicatrix at its site, and the liability of ventral hernia to form there. These are the objections to the clamp, and they are so valid that, at the present time, all distinguished ovariotomists have abandoned its use. Koeberlé, who was the last to relinquish it, had up to 1880 a mortality with it of 11 per cent. Since then he has had 74 cases, with 5 deaths.[1]

The actual cautery, performed by Paquelin's instrument or by platinum-tipped irons, which do not scale off or discolor the tissues, is

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[1] *Revue de Chirurgie*, 1885.

theoretically the very best way of dealing with the stalk. No foreign body, except the charred portion of the stalk, is left within the abdominal cavity; but, on the other hand, it cannot always be trusted to close the vessels. On this account it is looked upon with disfavor by all ovariotomists, with the exception of Keith. His method is as follows: The pedicle is spread out evenly within Baker-Brown's clamp, so as to get equable compression. The cyst is cut off, leaving a stump about an inch in height above the clamp. To protect the parts from heat, a folded napkin wetted in the carbolated solution is tucked under the clamp. The stump is next carefully dried, and then burned slowly down to the level of the clamp by wedge-shaped cautery-irons at a brown heat. They give off a whistling sound during the process. The thick end of the stump may be more quickly burned down, but the thin end should be burned very slowly, and the blades of the clamp, by prolonged contact with the cautery-iron, must also be made hot enough to dry and shrivel up that portion of tissue which they compress. In order not to disturb the stump after it has been cauterized, it is best to clean out the peritoneal cavity first, and to leave this treatment of the pedicle for the last thing. Before removing the clamp, which is to be unscrewed very slowly and carefully, one side of the pedicle is seized by a pressure-forceps, by which it is kept in sight and out of harm's way if the peritoneal cavity needs further cleansing.

The plan of treating the pedicle most in vogue, and the one which I adopt, is that of the ligature—one of fine carbolated silk, the finest compatible with safety. No. 4 is the size I usually employ. The ends are cut off close to the knot, and the stump is dropped into the peritoneal cavity, where the silk, being animal tissue, will in time become disintegrated and absorbed. Now, when I say silk, I mean silk, and not silver or gut ligature. Silver, being inelastic, cannot bind a shrinking stalk, while the gut is a treacherous ligature, and will sooner or later bring one to grief. It slips in the tying, it is liable to untie, it gives instead of shrinking, and it is too short-lived for the obliteration of large vessels.

The reasonable objection has been urged that, since the abdominal cicatrix left by the use of the clamp is liable to reopen every month to give vent to menstrual fluid, the same phenomenon will, by this intra-peritoneal method, happen within the abdominal cavity, and expose the woman to all the risks of a hæmatocele. But fact is here opposed to theory, for it has been found that either the oviduct in the stump atrophies into an impervious cord of fibrous tissue, or that its raw end, by contracting adhesions with the surrounding tissues, becomes hermetically sealed. It might also be supposed that the distal end of the ligatured stalk would slough and expose the woman to septic peritonitis. But such sloughing rarely happens, and for the following reasons: From

shrinkage of the stump the constriction is lessened, and the capillary circulation is re-established ; or the peritoneal surfaces, on each side of the narrow and deep gutter made by the fine silk, will bulge over and touch one another.   Adhesion then takes place between the two, and the blood-vessels which shoot over from the proximal, or uterine, side of the ligatured stump will carry life into the distal end ; or lymph, exuded by the irritation of the ligature, will throw a living bridge across the gutter in the stalk ; or, what is the least desirable, the raw end of a long stalk glues itself to any peritoneal surface with which it may come in contact.   I say least desirable, because sometimes such an adhesion makes a kink in the bowel, and may so constrict it as to give rise to fatal obstruction.   To prevent this accident, Thornton stitches with gut the raw end of the stump to the broad ligament, to which it adheres ; while Bantock catches it up out of harm's way by including it in the lowest abdominal suture, which, being of silkworm gut, can be left in for a long time.   If the stump be short, it stands upright, and does not then need this treatment.

If the stalk be a thick one, it is transfixed by a blunt needle, or by an aneurismal needle threaded with a double ligature, and is tied on either side, each half by itself, and then the whole is further tied by the free ends of one of the ligatures.   The "Staffordshire knot," recommended by Tait, may also be used.   If the stalk be a broad one, it is tied in three or more sections by cobbler's stitches.   If very thick or broad, it is a good plan to catch the stalk in Dawson's clamp, which compresses it circularly, and to transfix and tie it in the furrow made by the clamp.   This lessens the risk of secondary hemorrhage, which is usually caused either by the slipping off of the ligature or by its loosening through tissue-shrinkage.   When this clamp is used, the pedicle need not be tied until the wound is ready to be closed.   The stalk must be cut off at a distance from the ligature of not less than three-fourths of an inch, so as to leave a button of tissue sufficiently large to prevent the loops from slipping off.   In short and broad stalks the outer or broad ligament portion, which is thin and membranous and sustains most of the tension strain, is liable to slip out of its loop and cause a fatal hemorrhage.   To avoid this accident, the ends of the corresponding ligature may, before being tied, be repassed in opposite directions through the stalk very near its margin, so as to form the cobbler's stitch.   Another way is to pass a fine silk thread through the thin portion of the stalk, about one-third of an inch from its edge, and tie it.   In the notch thus made, and below the knot, is laid and tied the outer ligature.

In anæmic cases Thornton ties the arterial side of the pedicle first, but in young and vigorous women he ties the venous side first, so as to deplete the woman by gorging the tumor with blood.   While the

cyst is being cut away, the abdominal cavity must be so protected by sponges that not a drop of blood shall fall into it. A dilated oviduct in the pedicle tends to suppurate; hence, in such a case, the ligature should be applied as close to the womb as possible, so as to get below the expanded portion. Before the cyst is cut away, the pedicle should be seized on one side by a pressure-forceps, and kept more or less in sight until the wound is ready to be closed up. This will also prevent the ligatures from being rubbed off by the sponges while the abdominal cavity is being cleansed.

The "Staffordshire knot" (Fig. 288) is made as follows: The pedicle is transfixed by an aneurismal needle armed with a double thread. Into the loop of this thread are passed the ends of the ligature, which has been laid on the abdomen loosely around the pedicle. The needle, upon being withdrawn, brings with it these two ends of the ligature, which will now lie above their own loop. One of these ends is passed under this loop, and a square knot firmly tied. The free ends are now thrown around the pedi-

Fig. 288.

The Staffordshire Knot.

cle and again tied. Thus, it will be seen that this mode of securing the pedicle accomplishes by two knots what the ordinary double ligature effects by three knots.

The ligatures which have been applied to the pedicle or to adhesions either become encysted or in time disappear by absorption; but sometimes they behave like foreign bodies, and are discharged by an abscess opening usually in the abdominal wound. This happened to two of my cases, without, however, doing harm. A stubborn fistulous opening, following an abscess in the wound, should always lead to the suspicion of the presence of a ligature. Dr. T. Keith[1] and Dr. J. H. Thompson of Rome, Italy, each report a case in which the ligature was passed by the urethra. M. Quenu had a case in which more than a dozen silk ligatures came away per vaginam.[2]

In some exceptional cases the pedicle is so short or so rotten that neither the ligature nor the cautery can be used. The vessels in the pedicle must then be secured by several pressure-forceps, the handles of which, emerging like a drainage-tube from the lower angle of the wound, are to be tied together. After the lapse of forty-eight hours they are to be removed, but with great care.

The sac having been removed, the other ovary should be examined, and, if diseased, be tied and cut off. From the sundered bands of adhesion more or less bleeding has been taking place, which must now be attended to. It can usually be stopped by pressure with a sponge

[1] *Contributions to the Surgical Treatment of Tumors of Abdomen,* p. 17.
[2] *Archives de Tocologie,* Jan. 15, 1886, p. 28.

or with a finger, or with sponges wrung out of very hot carbolated water. For single vessels torsion will usually succeed, but, if it does not, fine carbolated silk or gut ligatures must be used; and it is wonderful how many can be applied without materially compromising the safety of the woman. I once tied over thirty vessels in a lady sixty-eight years of age, who recovered without any symptoms of peritonitis. The free ends of the ligatures should always be cut close to the knot. Stubborn oozing surfaces can very generally be staunched, by firm pressure with a sponge wrung out of very hot water, by searing them with Paquelin's thermo-cautery, or by passing a needle armed with fine silk under, and ligating, any vessel that may be detected leading up to the seat of the oozing. In some cases nothing answers so well as the pressure of the finger moistened with alcohol or with a drop or two of the ferric subsulphate or of the tincture of iodine. In oozing from inaccessible points in the pelvis, a sponge dipped in the undiluted solution of iodine, or in Monsel's solution of iron, and afterward well squeezed out, may be pressed firmly down for a few moments into Douglas' pouch. I have applied the ferric subsulphate—viz. Monsel's solution—repeatedly to oozing surfaces, and I have never had any occasion to regret its use. It blackens the tissues that it touches, but it does not seem to inflame them. I apply it unhesitatingly to the bleeding surface of the bladder, of the womb, of the intestines, and of the abdominal wall; but I take care that only enough for the purpose is used, and no more. When the oozing comes from a large surface of the abdominal wall, it may finally be arrested by the doubling of the raw surface on itself. The fold thus made is then secured either by a long acupressure needle or by cobbler's stitches passed through from skin to skin. Forty-eight hours after, this needle or these stitches should be removed. For this ingenious device we are indebted to the late Dr. Kimball of Lowell, Mass. Should all these measures fail, put in a drainage-tube, close up the abdomen in the manner about to be described, and temporarily lay over the dressings some heavy weights, such as bags of sand or of shot. This plan I have not been obliged to resort to, but it has the sanction of Nussbaum, who uses two large bricks, and it is worthy of being borne in mind.[1] In my hands an elastic flannel binder, pinned very tightly over a large pad of cotton wool, has made pressure enough to check the hemorrhage.

The Toilet of the Peritoneum.—By this is meant the peeling off from the peritoneum of plastic deposits, the removal of the sponges packed into its cavity, and the careful cleansing away of all fluids and of every blood-clot. In the search for all such foreign bodies, or, indeed, for obscure oozing-points, the portable electric light or the reflector of the ophthalmoscope or Colin's illuminating lamp will

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[1] *British Med. Journal*, Oct. 26, 1878, p. 617.

give much aid. When some of the contents of the cyst have escaped into the abdomen, or when much oozing has taken place from extensive adhesions, the peritoneal cavity must be washed out with warm water which has previously been boiled. Quart after quart is to be poured in, and paddled about with the hand until it returns clean. This can be readily done when a large tumor has been removed and there is plenty of room. But when the tumor is of small size and the incision short, the peritoneal cavity is best cleansed by a drainage-tube fastened to a fountain syringe, or by the vaginal nozzle of the Davidson syringe. Douglas' pouch, and the peritoneal fold between the bladder and the womb, are favorite localities for the collection of blood or of serum, and should therefore be thoroughly mopped out by small sponges on holders, otherwise peritonitis or septicæmia may result, which are the two great factors of death in unsuccessful cases.

Closure of the Wound.—When this has been thoroughly done, a clean sponge is placed in Douglas' pouch, another in the sulcus between the bladder and the womb, and a third, a large and broad flat one, is laid over the intestines under the wound, to catch the blood that may drop from the needle-tracks. Each needle is passed from within outward, a quarter of an inch away from the peritoneal edge of the wound, and is made to emerge at the same distance from its cutaneous edge. If the recti muscles are included in the sutures, there is said to be a liability to the formation of abscesses in the suture-tracks. Hence, Wells advises that the peritoneum and skin should be pinched together, and that the needle should be passed through them alone without perforating the muscles. Yet I believe that from a too close observance of this rule come many cases of hernia in the tract of the wound, and that were the recti muscles more closely coaptated they would not recede from one another, and thus aid in the formation of a rupture. My own rule is to include these muscles in the suture whenever they are exposed to view. The sutures should lie about one-third of an inch apart. The needles should be lance-pointed and held by a needle-holder. In fat women it is not always easy to get the two surfaces of the wound in exact coaptation; consequently, more or less puckering and eversion of the edges may take place. To avoid this, it will be well, before passing the needles, to bring the edges of the wound together, and make, with a fountain-pen, transverse lines at proper intervals across the incision as landmarks for the introduction of the sutures. These cross-lines are also of advantage, whenever the abdominal walls are too tense for accurate coaptation, as after oöphorectomy, after the removal of a small abdominal tumor, or after an exploratory incision for a solid tumor which cannot be removed. In these cases, indeed, it would be well to make the cross-lines the first step of the operation, before even the abdominal incision has been made.

The reasons why the needle is made to enter the peritoneum first are, that the stitches are lodged more evenly on that vulnerable surface, and with less injury to it, such as the stripping of it off from the abdominal wall; and, further, that a stray knuckle of bowel is not so likely to be wounded by the upward as by the downward thrust of the needle. The object of including the peritoneum in the stitches is to bring in contact two long and narrow ribbon-like surfaces of a membrane, which will quickly unite—so quickly as to forestall any formation of pus in the overlying issues, and to bar the entrance of this or other septic fluid from the wound in the abdominal wall. Another advantage is, that this inclusion of the peritoneum, by presenting an uninterrupted surface of parietal peritoneum to the visceral peritoneum, prevents the adhesion of the omentum and of the intestines to the internal lips of the wound, which otherwise takes place.

Through fear of the formation of ventral hernia, some very excellent operators in this country close the wound by three tiers of sutures. First, the peritoneum is brought together by a continuous gut suture; next, the linear edges of the tendon forming the linea alba are sewn up in the same way; finally, the cutaneous surface of the wound is closed by deep sutures of silk or of wire, which reach the peritoneum, but do not go through it. The objections to this treatment are, the precious time spent in making it, and the doubt as to its utility. Since placing the sutures very closely together—viz. three to the inch—I have had but a single case of ventral hernia. But in very fat women, in whom it is not easy to get perfect coaptation of the whole depth of the wound, I should be disposed to resort to the three tiers of sutures. Yet, according to Tait, "hernia happens in the practice of every one, no matter how the wound be stitched."[1]

As the tissues of the umbilicus are very thin, and liable to form a hernial protrusion, either their peritoneal edges should be first united by gut sutures, or else the navel itself should be wholly excised.

When a ventral hernia already exists, its sac should be dissected out, and the superfluous and attenuated walls should be removed by two elliptic incisions. The edges are then to be brought together by the three tiers of sutures.

After the removal of a very large tumor there often remains, between the separated recti muscles, a wide area of thin tissue consisting merely of skin and of peritoneum. This, if left, makes a pendulous belly, greatly weakens the retentive power of the abdomen, and is a never-ending source of annoyance. It, therefore, should be removed by the scissors, in one long band on each side of the abdominal incision.

When all the sutures have been passed, their ends on one side are loosely twisted together into a single strand, which is securely caught

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[1] *Brit. Med. Journ.,* May 15, 1886, p. 923.

by a pressure-forceps. The same thing is done with the ends on the other side. A finger of each hand is now passed down into the centre of the wound, and the upper sutures are separated from the lower ones by their being drawn to opposite angles of the wound. This permits the removal of the sponges, and, if they are stained with blood, the further search for some overlooked bleeding vessel. To guard against twisting of their convolutions, the bowels, still further disturbed by these final manipulations, are now restored to their natural position, and the omentum, after being again examined for some bleeding vessel, is gently spread out over them. The forceps and sponges are then counted, to see that not one has been left in the abdominal cavity. The importance of this cannot be too strongly impressed upon the operator, for distinguished ovariotomists have overlooked these articles, and have left them behind in the abdominal cavity—a sponge and a bulldog forceps in one case.[1] Tait has heard of ten such cases.[2] It is, indeed, sometimes no easy task to find a missing sponge when lost in the convolutions of the intestines. The sponges, therefore, should not be much smaller than the fist. Should the incision be a long one, the flat sponge, placed over the bowels to catch the blood from the suture-tracks, need not be removed until the wound is nearly closed up.

Before closing the wound the operator removes the pressure-forceps, and catches in one hand all the ends of the sutures on his side; his assistant does the same thing on the other side, and the edges of the wound are brought together by a firm pressure, which also chases the air out of the abdominal cavity. To stop the bleeding from the needle-tracks as soon as possible, each suture is rapidly tied, and by the surgeon's knot. When the whole wound has been closed, and not till then, the ends of all the sutures are gathered together in one hand, and they are cut off about two inches from the knot by one snip of the scissors. This saves precious time, which would be lost were each suture by itself to be cut after being tied. At gaping points of the wound intermediate superficial stitches should be put in. In fat women several such stitches will usually be needed.

Dressing of the Wound.—After the wound has been closed, the rubber apron is removed and the abdomen cleansed and dried. The wound may now be dressed according to Lister's plan. This consists—first, of a narrow protective of prepared oiled silk, moistened by a 1 : 40 solution of carbolic acid; next, of one broad layer of antiseptic gauze wetted with the same solution; and over this eight folds more of the

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[1] *Lancet*, May 26, 1877, p. 783; Jan. 9, 1886; *Brit. Med. Journ.*, Jan. 28, 1882, p. 115; *ibid.*, Dec. 25, 1880; also *Ovarian and Uterine Tumors*, by Spencer Wells, London ed., p. 336; H. P. C. Wilson, in *Trans. Am. Gyn. Soc.* for 1885; Doran, in *Gynecological Operations*, p. 238; *Journ. Am. Med. Assoc.*, Jan. 10, 1885, p. 50; *Medical News*, Feb. 21, 1885, p. 218.

[2] *Diseases of the Ovaries*, by Lawson Tait, 4th ed., p. 261.

dry gauze, having a piece of mackintosh interposed between the seventh and the eighth layer. The lamp is now blown out, and, the spray-jet being turned away from the abdomen, the dressing is secured by an elastic flannel binder, the rucking of which can be prevented by tapes pinned to it around each thigh. Most of the leading ovariotomists, however, employ simpler dressings, which have been found equally antiseptic. Wells covers the wound with a dry dressing of thymol cotton, kept in place by long strips of adhesive plaster going two-thirds of the way around the body. Over all is pinned a flannel binder. The thymol cotton is prepared by steeping absorbent cotton wool in a solution of one part of thymol to one thousand of water, and drying it. Keith dresses the wound with gauze wrung out of a 1 : 8 glycerole of carbolic acid. On this are laid several layers of dry carbolated gauze, next some cotton wool, and over all a flannel binder. Thornton uses Lister's gauze and the mackintosh, but without the protective. This dressing is secured by adhesive straps. On these are laid several folded napkins, and over all a flannel binder is pinned very tightly. Bantock resorts to dry absorbent gauze. Tait uses nothing but ordinary absorbent cotton. Salicylated cotton I have found to answer so well that for years I used nothing else. It is made by steeping two parts of absorbent cotton in a solution of one part of salicylic acid to two of commercial ether, and afterward drying the cotton by a low heat. Lately, I have been trying Keith's dressing, after first dusting the wound with iodoform, but it probably possesses no greater advantages. Over this dressing is laid a large pad of raw cotton, which has been made aseptic by being baked in an oven. This is secured by adhesive straps, the best being made of rubber plaster. These straps should never meet or overlap on the back, but they should be as short as possible, so as not to impede distension from flatus.

The flannel binder having been pinned on, the night-dress is pulled down and the patient put to bed. The six bottles of hot water are applied to different portions of the body, and she is covered with warm blankets. The tables, tubs, and other articles used in the operation are now removed, the room is darkened, and she is left alone with her nurse, who has positive instructions to admit no one besides the physician.

Drainage.—When blood in small quantities is effused into the peritoneal cavity, coagulation usually takes place, the serum is then absorbed, the clot becomes organized, and no harm results. But when blood in large quantities collects in Douglas' pouch, it may behave as a foreign body and cause mischief. When, also, blood is mixed with serum, coagulation is not so likely to take place ; the blood-corpuscles then are liable to break down, the fluid to become putrid, and septicæmia to set in. For these reasons the removal of

these fluids by different modes of drainage has long been put in practice. The best mode is by a glass tube passed down to the bottom of Douglas' pouch through the abdominal wound, and not, as has been recommended, through a special opening made for it in the roof of the vagina. Drainage is at present very rarely resorted to by those operators who use strict antiseptic precautions, for they contend that septic changes in the blood do not then take place. Wells and Olshausen have virtually given it up; Thornton and Meredith, who both use the spray, resort to drainage occasionally; while Keith, Tait, and Bantock, who have abandoned Listerism, are warm advocates of it. This question is a very important one, because a drainage-tube tends to the formation of a ventral hernia, and, being a foreign body, is in itself hurtful, and therefore should not be resorted to unless it will do more good than harm.

After a careful consideration of the subject, I am forced from experience to believe that between the two extremes there lies a golden mean, and that drainage, even when the spray is used, is needed under the following conditions:

(*a*) Whenever a purulent or a colloid cyst has burst, and its contents have escaped into the cavity of the abdomen, either during the operation or some days beforehand.

(*b*) Whenever the contents of the cyst are putrid or purulent, and septic symptoms or those of peritonitis are present.

(*c*) Whenever a large amount of ascitic fluid is found in the abdominal cavity, or the latter is infected by papillomata.

(*d*) Whenever all oozing cannot be stopped, or whenever four drachms or more of pure blood, or especially of a sero-sanguinolent fluid, can be squeezed out of the sponge in Douglas' pouch when removed just before the closure of the wound. But it must not be overlooked that the mere irritation from this sponge will cause the exudation of a pale-red serum, which does not imply the need of drainage.

(*e*) Whenever there are extensive adhesions in a person advanced in life, or whenever it has been deemed needful to cleanse the peritoneal cavity by irrigation.

(*f*) Whenever the operator is in doubt what to do.

Should it be deemed needful for some of the above reasons to make use of drainage, a glass tube, open at both ends and about six inches in length, is passed through the salicylated cotton or other dressing, then between the two lowest stitches, down to the bottom of Douglas' pouch. A wire suture is first introduced between these sutures and left untwisted, its object being to close firmly the opening left by the removal of the tube, and to hasten its union. Otherwise, a weak cicatrix results, tending to the subsequent formation of hernia. Keith's drainage-tube of three sizes is the one that I prefer. Its lower end is perforated with

holes, and its upper end has a shoulder, which keeps it from slipping into the abdominal cavity, and also enables it to hold a piece of thin rubber sheeting about eighteen inches square. In the centre of this a small circular hole is made, which, by stretching, is sprung over the tube. The mouth of the tube is covered by a cup-shaped sponge wrung out of a 5 per cent. solution of carbolic acid, and over this the rubber sheeting is folded four times. The flannel binder may either be pinned loosely over the drainage-tube, or else it may be slit at the tube and passed on each side of it, leaving the sponge and rubber sheeting outside of the dressing. They are then best held in place by a separate strip of flannel, so as to permit inspection without interfering with the main dressing; but pressure must not be put on the tube. Several times a day the sponge is removed, squeezed out, cleansed in a 5 per cent. solution of carbolic acid, and replaced. This in a general hospital had better be done under the spray. Bloody serum collecting in this tube is sucked out—every two hours at first—either by a fine rubber tube attached to a syringe, or else by the long nozzle itself of the ordinary uterine syringe. Some surgeons recommend that sterilized wicking, or a twisted roll of antiseptic gauze, be put in the tube, to exhaust the fluid by capillary attraction.

Whenever hemorrhage is indicated by the escape of pure blood from the tube, the blood must be sucked out every few minutes, until it ceases to flow. This, by keeping the bleeding point dry, favors coagulation, and the tube thus becomes an excellent hæmostatic. In three cases Tait arrested the hemorrhage by a "timely injection of a solution of perchloride of iron through the drainage-tube on to the bleeding surface."[1] But this heroic treatment can be resorted to only in cases of oöphorectomy, or of those of ovariotomy in which the adhesions were pelvic. In all other cases the wound will have to be reopened, and the bleeding vessels searched for.

As a rule, unless the drainage-tube is inserted into a sac, or unless the discharges from it become offensive, detergent injections should not be made into it. The best injections are 5 per cent. solutions of carbolic acid or of sulphurous acid, and a 1 : 2000 solution of corrosive sublimate.

A drainage-tube can drain the whole peritoneal cavity for probably not more than eight-and-forty hours, because by that time it will have become encapsulated by the surrounding intestines through adhesive inflammation. It will, however, drain the pelvic basin for a longer period of time, and it is therefore of special advantage in cases of small tumors—such as in oöphorectomy—and in cases of a large tumor in which the adhesions were limited to the pelvic region.

[1] *British Gynecological Journal*, Aug., 1887, p. 192.

During this process of encapsulation shoots of organizing exudation are liable to penetrate the lateral openings in the tube, and to grow rapidly to a remarkable size. When the tube is removed for good, these imprisoned growths will necessarily be forcibly torn off, and cause hemorrhage and local injury. I have known several instances in which, from this cause, the surgeon had much difficulty in removing the tube. To avoid this misadventure, the tube should be turned completely round on its long axis at least once a day.

In order to prevent undue pressure upon the rectum, with consequent sloughing and the formation of a fecal fistula, of which several cases have been reported,[1] the tube must be lifted up at each dressing about half an inch, and allowed to slip back of its own accord. It should also, whenever practicable, be changed for a shorter one. If the tube is to remain in any length of time, a rubber one had better be substituted for the glass one.

The drainage-tube is to be removed whenever the discharge has been reduced to not more than one or two drachms of clear serum; and this usually happens within the first forty-eight hours. After its removal the opening left in the wound is closed by twisting the free ends of the wire suture placed there for this purpose.

After-Treatment.—The subsequent treatment needs the greatest attention. The first care is to establish reaction. This is best done by heat, and by stimulants, such as brandy and whiskey given in iced soda-water. Enemata of beef-tea and brandy, or of milk and brandy, will also be of advantage, while artificial heat is kept up. For the vomiting, which comes partly from the anæsthetic and partly from shock, repeated deep inspirations should be tried. They help by getting the blood rid of the anæsthetic as soon as possible. Chloral or cocaine may also be given, or small lumps of ice may be swallowed. Sips of very hot water, or a tablespoonful every hour of a mixture containing equal parts of lime-water and of cinnamon-water, may also do good. A hypodermic of morphia will often allay vomiting, and I have seen it yield to small doses of atropia, and also to two grains of pure pepsin, given every two hours in a tablespoonful of raw-beef juice. An excellent combination is one of morphia, atropia, and sodium bicarbonate. Twenty drops of ether given by the mouth will sometimes relieve it, and so also will a few drops of chloroform confined by a watch-glass over the pit of the stomach. In some cases I have tried, with the best results, the following effervescent mixtures, recommended by Chéron:[2]

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[1] *British Gynecological Journal,* Aug., 1887, pp. 194, 196; *General and Operative Gynecology,* by Hegar and Kaltenbach, 1st Amer. ed., p. 246; Alexander: *Medical Chronicle,* Oct. 1, 1887.

[2] *Archives de Tocologie,* Février, 1883, p. 122.

R̥. Potassii bicarb.
  Potassii bromidi, āā.   gr. xxxij ;
  Aquæ,   f℥ij. M.

R̥. Acidi citrici,   ℨj ;
  Syrupi,   f℥j ;
  Aquæ,   f℥iv. M.

A dessertspoonful of the former is added to a tablespoonful of the lat-
ter, and given every hour.   For vomiting, especially of the bilious
variety, Tait recommends Mason's pepsin wine, given every ten min-
utes in drachm doses with a little ice-water.

Flatus is another annoying symptom, which, however, can very
generally be dispelled by turning the patient over on her side, and
inserting a flexible catheter high up in the rectum. If this fails to
relieve it, enemata of turpentine may be tried, or five-drop doses of
the tincture of nux vomica may be given every two hours. Should the
abdomen become painfully bloated, the binder must be loosened and the
adhesive straps nicked in several places. The painful tension on the
stitches can be relieved by drawing the knees up and supporting them
over a pillow doubled on itself. Should the flatus not yield, or symp-
toms of obstruction set in, the bowels must be opened at all hazards.
Seidlitz powders, castor oil, and Epsom salts are good cathartics for this
purpose. When vomiting accompanies obstruction, calomel answers best,
because it is not so liable to be rejected.

For the first twenty-four to thirty-six hours after the operation noth-
ing whatever should be given to the patient by the mouth, excepting sips
of hot tea or of hot toast-water or of barley-water, and an occasional
teaspoonful of old whiskey. During this time, if the thirst be excessive,
a pint of warm water may be thrown up the rectum. If the patient be
anæmic, nutrient injections of beef-tea may be given every two or four
hours, three ounces at a time. But it is well even then to spare the
stomach as much as possible, especially for the first thirty-six hours.
One teaspoonful of Johnston's fluid beef, dissolved in a cup of hot
water, makes an excellent enema for this purpose. After that time
tablespoonful doses of milk, of beef-tea, of thin and strained oatmeal
gruel, or of barley-water, can be given every hour or two. The diet
may then be cautiously increased, and especially after wind begins to
escape from the rectum, the patient being enjoined not to hold it back
from motives of delicacy. If the condition of the patient is such as to
demand more nourishment, it had better be taken by the rectum. The
urine should be drawn off by the nurse, unless the patient can, without
much straining, pass it herself into a urinal. To avoid cystitis or an
irritable bladder, each catheterization should be preceded by a cleansing

of the meatus and vestibule with a 1 : 2000 solution of corrosive subli-
mate, and the catheter should also be immersed in the same disinfectant.
No anodyne whatever need be given unless called for by great pain,
wakefulness, or restlessness; for opiates, by paralyzing the bowels,
favor tympanites. They also make the secretion of urine scant, and
they should, therefore, be avoided as much as possible. A hypodermic
injection is the best way of giving an opiate. Should the body-heat
indicate a temperature of 101° Fahr. or over, a bladder filled with
broken ice, or, what is far better, a rubber ice-cap, should be kept on
the head of the patient as long as it feels comfortable and does not
chill her. If the temperature does not fall, and peritonitis or other
septic symptoms set in, the bowels must be at once moved, either by
calomel or by a saline cathartic, aided by enemata of soap-suds and
turpentine. Ice should also be applied to the pit of the stomach.
Quinia, morphia, and antipyrine must then be given in very large
doses, preferably by the rectum, together with ten drops of the tinc-
ture of digitalis every hour, until the pulse-rate is lessened and the
temperature falls.

The patient need not be kept rigidly on her back, but can be turned
over on her side by the aid of the nurse. A pillow doubled on itself
and placed under the knees is always a great comfort; and so are two
beds, the one for the day and the other for the night. But if the patient
is very heavy, it would be safer not to attempt to move her.

When five or six days have elapsed, the bowels should be opened;
and, as this is a matter of importance, and is occasionally attended with
symptoms of obstruction and with a good deal of constitutional dis-
turbance, a few words will not come amiss. If the hardened feces can
be softened down and dislodged by enemata, this is perhaps the best
plan, elysters of ox-gall and water, or of glycerin and water, being the
most efficient. But in my experience enemata have so often failed that
I rarely resort to them in the first instance. If the woman's stomach
is not irritable, I prefer to give her an ounce of castor oil. This is dis-
guised in the compound syrup of sarsaparilla, in cold black coffee, or
in some other suitable vehicle, as warm milk, and is brought to her,
without any previous warning, early in the morning. Should it be
deemed unwise to try the oil, two Lady Webster pills and two com-
pound cathartic pills can be given at bedtime of the seventh day, or a
pill containing three grains of the compound extract of colocynth with
one grain of the extract of hyoscyamus may be swallowed every four
hours. The compound licorice powder of the German Pharmacopœia,
to which has been added potassium bitartrate, also answers well, pro-
vided the patient's stomach will bear teaspoonful doses every four
hours. Should these remedies fail to act, they must be supplemented
by enemata.

Fatal obstruction of the bowels from matting, or from constricting bands of organized lymph, caused by peritonitis, has been frequently reported. Thus far, I have met with two fatal cases, one of which, however, passed out of my hands after the operation. But occasionally I see cases of obstinate constipation which give me great uneasiness and put me to my wits' ends. In one case, after the failure of other remedies, the obstruction was overcome by broken doses of calomel combined with sodium bicarbonate, and by the distension of the lower bowel with very large enemata slowly given by the rectal tube. Another desperate case yielded to repeated doses of tincture of belladonna. A third case, complicated by obstinate vomiting, was saved by ten grains of calomel given every two hours until the bowels were moved. Seventy grains were thus administered before the desired effect was attained, yet salivation did not occur.

Tympanites is always the forerunner of obstruction. So, whenever it occurs, and wind does not escape by the rectum, it is an excellent plan to try the insertion of a rectal tube. If this fails, turpentine enemata or saline cathartics should next be resorted to, and without delay. When symptoms of obstruction slowly come on, relief is sometimes afforded, as Thornton suggests, by ten minims of liquor morphinæ hydrochloratis (B. P.), and by two minims of liquor atropiæ (B. P.), given every three hours, until the distension is relieved.[1]

In cases of obstruction resisting all treatment, it will be needful to reopen the abdominal wound, and search for the constricting point. But these cases usually end fatally, if the trouble arises during the first week.

When symptoms of obstruction once present themselves, they are likely to recur. The contents of the bowel should, therefore, be kept fluid, and for this purpose I know nothing better than the German compound licorice powder, given in teaspoonful doses at bedtime.

Suppression of urine sometimes follows ovariotomy, and in cases of diseased kidney is an alarming complication. It is due generally to shock, sometimes to poisoning from the carbolic-acid spray, and occasionally to the use of ether as an anæsthetic, when the kidneys are diseased or they act sluggishly. For this symptom digitalis and the acetate of potassium should be given. Thornton treats it by baring the arms and packing them in towels, which are kept wet with ice-water.

Tetanus may destroy the life of a patient while convalescing from the operation of ovariotomy. J. M. Bennett and others report such cases.[2] The symptoms in Bennett's case first showed themselves on the sixteenth day, and the woman died two days later. Chloral in

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[1] Doran: *op. cit.*, p. 265.

[2] *Lancet*, Dec. 3, 1881; Doran: *op. cit.*, p. 269; Meinert: *Annales de Gynéc.*, Janvier, 1887.

drachm doses, administered by the bowel in the yolk of an egg, is perhaps the only remedy from which any good can be expected.

Phlegmasia alba dolens of the lower extremities may occur. It happened in one of my cases, and was cured by frictions with belladonna and blue ointment and by firm bandaging.

Occasionally, a few days after the operation, without any septic symptoms whatever or without any marked rise in the temperature, the parotid glands grow tender, swell up, and run through a course precisely like mumps, ending in resolution. This complication has been met with so frequently by myself and others that it cannot be a mere coincidence, but must be due to a reverse sympathy between the ovaries and these glands. It does not appear to increase the risk of the patient, for recovery took place in all the reported cases, of which three occurred in my own practice.[1] Parotid bubo may also take place after ovariotomy, but this sign of blood-poisoning, being a general one, happens as well after other grave surgical operations and during the course of specific fevers. Yet, from the sympathetic relation between the parotid glands and the sexual organs, it seems to occur more frequently in the septicæmia following ovariotomy.

Acute mania sometimes follows ovariotomy, especially when both ovaries have been removed. The attack is usually temporary, but it sometimes ends in insanity, and even in death, as in one of my own patients. Keith, Thornton, Tait, Bantock, Bryant, A. Martin,[2] and other leading ovariotomists report analogous cases.[3]

Surgical After-treatment.—The dressings, being antiseptic, need not, as a rule, be removed until the day following that on which the bowels are moved—viz. on the eighth day. Every other stitch may then be removed, and especially all that are loose or are cutting the tissues. The wound is then washed with a 2.5 per cent. solution of carbolic acid, dusted with iodoform, and dressed anew with salicylated or iodoformed cotton. I usually find the first dressing so sweet that I am able to reapply the unsoiled portion of it for a second dressing. A clean binder is now pinned on, and the woman's clothing changed. Three or four days later all the stitches should be removed, the wound secured by narrow adhesive strips, and dressed as before. For fear of a weak cicatrix and the formation of a hernia at the site of the wound, the patient should not get out of bed until fully two to three weeks have elapsed, and should for several months wear some kind of close-fitting gored binder or abdominal supporter. On the other hand, Treves con-

[1] Wm. Goodell: *Transactions of American Gynecological Society*, 1885; also, S. Paget: *British Medical Journal*, vol. i., 1887, p. 613.

[2] *Pittsburgh Medical Review*, January, 1888, p. 5.

[3] *The British Medical Journal*, March 21, 1885, p. 597, and March 22, 1884, p. 563; also, *Medical and Surgical Reporter*, May 29, 1886, p. 692.

tends that an abdominal supporter should not be worn after a laparotomy.[1] He says, "Muscle can be made strong only by use. If a belt be worn, the responsibility of supporting the viscera is thrown, not upon the abdominal muscles, but upon the instrument. The muscles are not encouraged to act. They are in the same position as the biceps when the arm is carried in a sling—wasting from disuse. To prevent a ventral hernia, the patient should not be allowed to get up too soon. A month in bed is not an unreasonable time. She should not get up until the wound is sound. She may wear a light flannel binder for a few weeks after she is about again, but at the end of that time she should discard supports of all kinds." This advice is, I think, sound, provided the patient is willing to stay a full month in bed; otherwise it is not to be followed. Nor should the patient, for six months at least, lift anything heavy, such as a scuttle of coal or a basket of clothes.

If, before the week is over, the dressings become soiled or give out a bad odor, they should be at once renewed. They should also be removed whenever a high temperature, without being accompanied by tympanites, leads to the suspicion of cutaneous abscesses.

Accidents during Ovariotomy.—When by the breaking up of adhesions to it the liver is wounded, the bleeding surface can usually be staunched, as Koeberlé has shown, by the ferric subsulphate applied to the raw surface by the finger. If this fails, the actual cautery at a dull heat should be used.

Should the gall-bladder be torn slightly, sew it to the abdominal wound and establish a fistula. If it is very badly torn, it should be wholly removed. With our present light, it would be deemed unsafe simply to stitch up a tear of this viscus.

The rectum has frequently been torn, especially in the enucleation of intra-ligamentary cysts, and also in the extirpation of adherent ovaries and oviducts in oöphorectomy. The wounded viscus being too deeply situated to be sewed up, a large drainage-tube must at once be inserted. The prognosis in these cases is by no means a bad one, for in most of the reported ones the whole contents of the bowel escaped through the drainage-tube, and the patient recovered. Tait,[2] Wells,[3] and Palmer[4] have met with this accident. Out of two of my cases, one died, but from the severity of the operation, and not from the tear in the rectum.

If, unfortunately, an adherent portion of the small intestines is torn open, the wound should be carefully closed with very fine silk by the

[1] *The Lancet*, Sept. 24, 1887, p. 604.

[2] *Medical News and Gazette*, May 17, 1884, p. 681; *Brit. Gyn. Journ.*, Aug., 1887, p. 193.

[3] *Brit. Med. Journ.*, 1878, vol. ii. p. 865.   [4] *Medical Record*, June 6, 1885, p. 636.

continuous suture. The sutured portion is then fastened to the lower angle of the abdominal wound as a safeguard in case of the subsequent formation of stercoral fistula.[1] Should the intestine be injured to any extent, the wound must be closed by the Czerny-Lembert suture (Fig. 289), which consists of two sets of fine silk sutures—the first set, five to the inch, uniting the serous edges of the wound either by the continuous suture or by the interrupted one; the other set, six or eight to the inch, uniting one serous coat to the other, at a line about one-quarter of an inch distant from the wound, by the continuous suture. An ordinary cambric needle with fine sewing silk will answer admirably for this purpose.[2] In small wounds one continuous suture, carried through all the coats but the mucous, will suffice. A mere puncture can be closed by hooking it up and surrounding it by a single fine ligature.

FIG. 289.
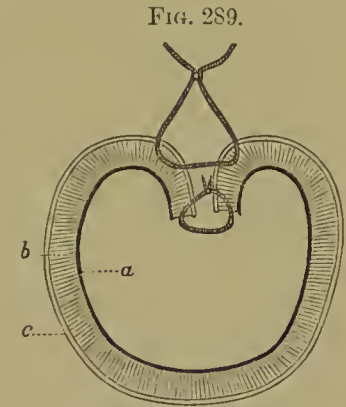
Czerny's Suture: *a*, mucous membrane; *b*, muscular coat; *c*, serous coat.

Wounds of the bladder have frequently happened, but they are by no means necessarily fatal.[3] These accidents are liable to occur when the bladder, being adherent to the cyst and carried upward by it, lies directly under the line of incision, or the bladder may be torn open while adhesions to it are being severed. The wound should at once be grasped by a pressure-forceps, the bladder emptied by the catheter, and the operation proceeded with. When the operation has been completed the wound in the bladder is attended to, and in one of the following ways: Either the vesical wound is brought up within the lips of the abdominal incision, and is closed by being included in the abdominal stitches, or it is closed by the continuous or Glover's suture, without including the mucous membrane in the stitches. A self-retaining catheter, such as the Skene-Goodman, must then be kept in the bladder for at least a week.

Should the womb be badly lacerated, fine sutures will sometimes stop

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[1] "Discussion on a Paper by Garrigues," *Am. Gyn. Soc. Trans.*, 1881.

[2] There is a misapprehension on the part of the profession with regard to the Czerny stitch. Czerny unites only the serous edges of the wound, and not the mucous edges, as is frequently stated. He has, however, quite lately sewed up the edges of the bowel by through-and-through stitches, including all the tissues—serous, muscular, and mucous—as in an ordinary wound elsewhere, such as the abdominal incision. The Lembert suture must not pass through the whole wall of the gut, lest gas or thin fecal matter should escape into the peritoneal cavity through the stitch-holes. It is more secure when it also includes the muscular coat.

[3] Eustache: *Arch. de Tocol.*, April and May, 1880, pp. 193, 277; *Boston Med. and Surg. Journ.*, Feb. 16, 1882, p. 153; *Brit. Med. Journ.*, Jan. 28, 1882, p. 115; *Am. Journ. Med. Sci.*, Jan., 1883, p. 123; Doran: *Tumors of the Ovary*, p. 74.

the bleeding. Should they fail, the wound should be seared by the thermo-cautery. Occasionally it will be needful to perform hysterectomy.

One of the ureters will sometimes be torn across while pelvic adhesions are being broken up. This accident is most likely to happen during the enucleation of a cyst enveloped in the folds of the broad ligament. It is almost always fatal, and is usually not discovered during the life of the patient, and, I am disposed to think, not often discovered after her death. Sometimes, however, urine will ooze out of the abdominal wound, and in rare cases the patient has recovered with a urinary fistula. In such a case Simon[1] successfully removed the corresponding kidney; Nussbaum[2] constructed an artificial ureter leading from the fistula to the bladder; and Tauffer[3] inserted the upper end of the divided ureter into the bladder by an artificial opening. It, however, failed to unite, and he later made an artificial ureter. If the ureter is, unfortunately, torn across, it seems to me that the best plan would be, either to bring the severed end out at the lower end of the abdominal wound, and secure it there, or else to make a hole in the bladder and sew into it the ureter, as Tauffer did. One operator, whose reference I have lost, at once removed the kidney on the corresponding side, and saved his patient.

In cases of ascites complicating ovariotomy, the ascitic fluid should not be wholly removed until the cyst has been cut off and the wound is ready to be closed. By this means any blood oozing from broken adhesions, or any fluid escaping from the cyst into the abdominal cavity, being diluted, is less likely to irritate the peritoneum, the cavity of which can also be more readily cleansed.

When a patient seems in danger of dying on the table from shock or from exhaustion, the anæsthetic should be withheld while hypodermic injections of ether and enemata of brandy are given. Warmth should also be applied to the body by bottles of hot water, or, what is better, by rubber bags of hot-water. Theoretically, atropia administered subcutaneously would be the proper remedy, but I have not yet tested it. In all severe cases of ovariotomy, especially if the operation be prolonged, the woman should not be kept profoundly under the influence of the anæsthetic for any length of time, but should be allowed from time to time to come to, at least enough to make her flinch or move about. This caution should especially be observed in very feeble patients and in those with very large cysts. Transfusion will sometimes be of benefit. The transfusion solution of Mikulicz is approved by many surgeons. It consists of eight grains of sodium carbonate and one drachm and a half of sodium chloride, dissolved in

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[1] *Ann. de Gyn.*, June, 1877.   [2] *Edin. Med. Journ.*, July, 1876, p. 1.
[3] *Arch. de Tocol.*, April, 1880, p. 201.

one pint of warm distilled water. Twelve ounces of this may be slowly transfused into the radial artery or the radial vein.

Shortly after the removal of the stitches, the abdominal wound will sometimes burst open. Fritsch,[1] Martin,[2] Bantock,[3] Doran,[4] and Terrier[5] report such cases. Every ovariotomist, indeed, has probably met with this very serious accident. Twice it has happened in my practice. In the first one, the stitches were prematurely removed, and on the next day the wound opened in its lower third. But the bowels did not protrude, and my patient's convalescence was uninterrupted. In my second case—one of oöphorectomy for a fibroid—the stitches were removed on the eighth day. Two days later, while she was drinking water, a few drops got into the trachea, and the violent fit of coughing which ensued burst open the whole wound. Even after the woman was completely anæsthetized, it was no easy task to return the protruding and swollen bowels, and to sew up the wound. She died a few hours later, apparently from shock. Whenever this accident comes from mechanical causes, the prognosis is favorable; but it is far otherwise when the edges of the wound are unhealthy, or septic tympanites is present. The difficulty then will lie in the return of the bowels. In some cases it may indeed be needful to lessen their size by puncture.

The Removal of Both Ovaries.—Whenever both ovaries are diseased there can be no question about their extirpation. But when only one has undergone cystic or other degeneration, the question of the removal of the sound one may come up. There always is a tendency to the subsequent degeneration of the sound ovary after the diseased one has been removed. More especially is this tendency observed in sterile women and in those with malignant affections of the ovary. Many women, therefore, whose lives should have been imperilled but once, have been compelled to face the dangers of a second operation. In view of these facts, it seems to me wise to remove the sound ovary in all cases of sterility, in every case of malignant degeneration of one ovary, in all cases of colloid cyst—a degeneration which in my experience is very likely to attack the sound ovary—and in all women who have either passed the climacteric or are approaching it, provided the removal is not attended with great additional risk. Double extirpation should also be performed whenever the womb contains a fibroid tumor, or whenever it seems desirable to hasten on the climacteric. In these convictions I am further strengthened by the disappointment often expressed to me by my patients that one ovary had been left behind, and by their great fear afterward lest the

[1] *Journ. of Am. Med. Assoc.*, Oct. 8, 1887, p. 464.
[2] *Medical News*, Sept. 11, 1886, p. 303.
[3] *London Med.-Chir. Trans.*, vol. lxiv. p. 123, Case xxii.
[4] *Tumors of the Ovary*, p. 128.   [5] *Revue de Chirurgie*, Sept. 10, 1887.

remaining organ should also become diseased. On the other hand, in women who are in the prime of their menstrual life the sound ovary should be left untouched, unless there exist grave reasons for its removal.

The Return of Cysts.—Benign cysts once removed never return; but after the removal of a malignant cyst the disease may return at the site of the pedicle and develop into another cyst.[1] This form of return I have seen twice. The disease, however, usually attacks the remaining ovary; or, if both ovaries have been removed, the liver or some other vital organ becomes secondarily infected. Yet there is no question that the removal of malignant cysts is followed by a marked improvement in the health of the woman and in a long reprieve from death.

THE COMPLICATIONS OF OVARIOTOMY.

The Intra-ligamentary or Encapsulated Cyst.—One variety of cyst—whether ovarian or not is yet moot—from its site between the folds of the broad ligament, from its papillary and quasi-malignant character, and from the difficulties attending its extirpation, needs special mention. It is called an intra-ligamentary, sessile, or encapsulated cyst, because it is always imbedded, partly or wholly, within the folds of the broad ligament. It contains much papillomatous material, and a few daughter-cysts filled with a clear fluid.

Malassez and De Sinéty are disposed to attribute it to cystic degeneration of supplemental ovarian tissue, lying between the peritoneal folds of the broad ligament. Doran refers it to the hilum of the ovary, and to morbid development of the tubular fœtal relics which there exist, and not to dropsy of the ovisacs in the ovarian stroma. Coblenz, on the other hand, deems it to be a true cyst of the broad ligament, but of that portion which lies between the ovary and the paraovarium, and which contains tubular fœtal relics.[2]

Instead of developing free into the peritoneal cavity, the intra-ligamentary tumor, if it starts from the hilum of the ovary, grows first toward and between the two folds of its own ligament—the tubo-ovarian—then buries itself between those of the broad ligament proper. It parts asunder these two serous folds more and more, the one from the other, and, lifting their skirts, it burrows under the peritoneum, beyond the strict limits of the broad ligament. Thus, it strips off the peritoneal coat of the womb and of the bladder, and, coming into direct contact with those organs—the naked tissue of the one with the naked tissue of the others—it fuses itself to them, and drags them upward. The relationship is now one of continuity, not of contiguity, and, in

[1] *Société de Chirurgie*, séances Dec. 9 and 16, 1885.
[2] I have written more fully on the subject of the intra-ligamentary cyst in a paper published in the *American Journal of Obstetrics*, Jan., 1888.

the efforts made by the operator to free these organs, the womb is often greatly injured and the bladder torn open. The tumor may next strip off the reflected fold of peritoneum of the lower abdominal wall, and solder itself to the denuded muscles. The abdominal incision will then reach the cyst without meeting with a layer of peritoneum.

The upper portion of the sac then bursts through its capsule of broad ligament, and grows free into the abdominal cavity, becoming intra-peritoneal, and with the characteristic nacreous appearance. But the lower portion of the sac remains covered with a pale-red peritoneal investment of broad ligament, between the layers of which it lies buried. There it is subperitoneal, and therefore extra-peritoneal. Should the sac develop downward, it separates the two folds of the broad ligament more and more, and burrows under and lifts up Douglas' pouch. It then may fuse itself to the ureters, to the rectum, and to the great iliac vessels, and all of these organs have been so torn by the operator as to result in speedy death. Twice have I had to dissect several inches of one ureter out of its attachments to the tumor. One of these cases recovered; the other died on the table. It is so difficult to recognize the ureter among the strips and bridles of laterated tissue that, in my opinion, this important tube is often torn across without the knowledge of the surgeon, and that it is, therefore, the cause of death in many cases. If the patient lives long enough, a flow of urine from the incision would then occur; but usually the patient dies before this could happen. Recently I had a successful case, in which a fecal fistula resulted from sloughing of the injured rectum. In another case, a fatal one, the subperitoneal portion of the cyst burrowed so low down between the vagina and the rectum as fairly to cause bulging of the posterior wall of the vagina, even out of the vulva. The operation was a most difficult one, and a fecal fistula was established a few days later.

From Douglas' pouch, after sealing itself to the bony walls of the pelvis, the sac burrows into the folds of the mesentery, or of the meso-colon, or of the mesocæcum, and engrafts itself upon these intestines by continuity of structure. As these viscera will now be forced up in front of the cyst, an unexpected resonance on percussion will embarrass the diagnosis. Further, the capsule itself of broad ligament is very liable, by inflammation, to contract secondary adhesions with contiguous serous surfaces, so that at the same time there may exist structural adhesions by continuity of tissue, and indirect inflammatory adhesions by conti-guity of tissue. This double set of adhesions greatly complicates matters, especially as every organ or viscus involved is distorted and displaced, sometimes beyond recognition.

Diagnosis.—The existence of an intra-ligamentary cyst cannot always be made out; but it can be reasonably suspected by the fol-

lowing signs, taken conjointly and not singly : Whenever an enlarged and a laterally displaced womb is so closely adherent to a cyst as to simulate fibro-cystic tumor of the womb; whenever the sound shows that the bladder is elongated vertically; whenever a pelvic descent of the cyst flattens the rectum or effaces the posterior vaginal *cul-de-sac*, and especially by small subsidiary cysts; whenever a cyst embarrasses the acts of defecation and of micturition; whenever the cyst ruptures of its own accord, and not by violence; whenever the growth of the cyst is accompanied by unusual pelvic pains; whenever percussion elicits marked resonance in front of a cyst that is large enough to displace the bowels laterally, and, therefore, to yield a flat sound; lastly, whenever a firmly-fixed cyst is unsymmetrical in shape, and more developed on one side of the pelvis than on the other.

When an intra-ligamentary cyst is exposed to view through the abdominal wound, it presents a very peculiar appearance. The lower portion of the sac in front is covered by a pale-red fibro-muscular capsule, like that of a uterine myoma, for which it may be mistaken. The upper and more distant portion of the front aspect of the sac presents the usual pearly hue of an ovarian cyst. This portion is often free in the peritoneal cavity, and without adhesions, while the encapsulated portion is subperitoneal and immovably fixed. Like an acorn in its cup, the cyst has not a stem or pedicle. Consequently, its blood-vessels enter it—not enclosed in a single slender stalk, as in ordinary ovarian cysts—but in two large sets, widely separated from each other by the intervening portion of the tumor. Thus, the uterine vessels enter it along the oviduct on the middle surface, and the spermatic vessels at the lateral border of the tumor. Sometimes the ligament intervening between these two sets of vessels splits open, and, separating, gives two distinct pedicles to the tumor.

Smaller, thin-walled cysts are often present. They do not spring from inside of the major cyst, but from a common base on the outside, on which they are sessile. According to J. Greig Smith,[1] " the uterus usually lies in a deep sulcus between the major cyst and the minor cysts, giving an appearance of two growths; but sometimes it lies behind the growths, and is overlapped by them."

The Operation.—No cases in surgery demand more coolness, pluck, and judgment on the part of the operator, and none put his resources so much to the test. These are the cases which die on the table, and in which the utmost watchfulness is needed lest fatal collapse should happen shortly after the operation. Formerly, when a cyst was found to be intra-ligamentary, the abdominal wound was hastily closed up and the case abandoned. Now, thanks to Miner[2] of Buffalo, N. Y.,

[1] *Abdominal Surgery*, p. 140.
[2] *Transactions International Medical Congress*, 1876, p. 801.

who first gave us the hint, we enucleate the sac from its capsule, and need rarely to be foiled.

Since the bladder is usually dragged upward, and since it may be adherent to the denuded muscles of the abdominal wall, the incision should be made with the utmost care, the grooved director and vesical sound being put into requisition. Before any attempt at enucleation is made, the major cyst should be emptied by the trocar, and the smaller sessile cysts by the aspirator. When all the fluid has been removed, the opening made by the trocar should be closed by a ligature or by a clamp-forceps. This is done to prevent any of the papillary growths from escaping into the peritoneal cavity and infecting it. No attempt should be made to lessen the size of the tumor by enlarging this opening and by breaking up the papillomatous mass with the hand. This procedure answers well enough in ordinary intra-peritoneal and glandular ovarian cysts. But in an intra-ligamentary papillomatous cyst the hemorrhage would be too free, and the risk too great of infecting the peritoneal cavity by the escape into it of papillomatous material.

Firm traction is now made upon the collapsed cyst, and in some few cases the whole encapsulated tumor can then be removed entire—the dragging forming a sort of pedicle of that portion of the capsule between the sac and the womb, to which it is almost always fastened. But this comparatively free condition of the capsule is rare, and the tumor will usually have to be shelled out of its capsular nest. Many vessels will need tying, and more will demand the pressure-forceps.

Miner's operation consists in slitting open the peritoneal capsule of the sac at points as low down as possible. One finger or more being introduced into these openings successively, the serous and vascular envelope is stripped off in bands, upward to points where the vessels become capillary. These bands, or flaps, of broad ligament are then to be tied, either singly or together, in one or two bundles, and the redundant portion cut off. Sometimes the actual cautery will answer better than the ligature. Several times it has happened in my practice that these flaps did not bleed, and it was not needful either to tie them or to sear them. A drainage-tube will always be needed. This mode of enucleation I have repeatedly and successfully performed, but it is a haphazard one, and it tears the capsule, which is a disadvantage.

An improved technique now aims to keep the capsule whole, and therefore to avoid, as much as possible, tearing or perforating it, as in Miner's plan. After the sac is emptied, it is lifted out of the abdomen by Nélaton's forceps, and the capsule is incised, little by little, in a circle on a line level with the edges of the abdominal incision. The sac is then, *pari passu,* so enucleated as to leave a neat cup-shaped cavity. To do this properly, it is well to begin the enucleation where large vessels enter the tumor, so as to cut off the supply of blood as early as

possible in the operation.   First tie and cut the spermatic vessels, which run on the lateral border of the tumor; for the sac has a large vascular capsule, and not a slender stalk, through which it is nourished.   Next, with the sound define the position of the womb, which is often masked, as well as dislocated, by the enveloping sac.   To this point carry a transverse incision through the capsule, from the spermatic vessels. Here will be found the large branches of the uterine artery.   These, when severed, must be secured by ligature or by pressure-forceps. Through this transverse incision an attempt is made with the fingers and the scissors to shell out the tumor, care being taken not to tear or to perforate the capsule; but such injuries to it are often unavoidable.

As the surgeon proceeds, he will have to tie or clamp many blood-vessels.   At times he will be wholly at sea, not knowing where he is; but by establishing the site of the womb and of the bladder by the sound, he will get trustworthy landmarks and safe points of departure. To prevent soiling of his hands, the sound should never be passed by the operator, but by an assistant.   When no further advance can be gained in front, the incision is extended around the whole capsule, and the enucleation is carried on from the sides and from behind in such a way that the uterine attachment is left until the last.[1]   The fact is, that one has to work from front to back, from side to side, gaining here and there a little, applying ligatures and catch-forceps at every advance, until the sac is wholly shelled out of its capsule, or until a sort of pedunculated attachment to the womb is formed, which can be ligated *en masse*.   This ligature will sometimes have to include uterine tissue. It will be still more likely to include a portion of the cyst itself.   In this case the secreting layer of the improvised pedicle should be either peeled off or charred by the thermo-cautery.   In like manner, when-ever attachments to important viscera cannot be safely severed, the adherent portion of the sac must be cut out and left behind, the secreting layer being afterward removed or destroyed.   In some cases it will be safer to extirpate the womb itself, together with the adherent sac, than to attempt to free it.

The base of the cyst, as has been stated, often burrows deep into the pelvis, and, being in close relation with the rectum, the ureters, and the iliac vessels, needs most careful enucleation.   Usually, several large blood-vessels here will need to be tied.   Sometimes they lie so deeply as not to be reached by the ligature, and they will then have to be caught by long pressure-forceps, whose handles must be brought out at the lower angle of the abdominal incision, and tied together.   They will then act the part of a drainage-tube.   Oozing must be treated by sponge-pressure, by the thermo-cautery, or by Monsel's solution of iron. Internal hemorrhage may also occur.   In one of my successful cases I

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[1] Hegar and Kaltenbach: *op. cit.*, p. 233.

had to reopen the wound four hours after the operation, in order to secure one of these deeply-situated vessels. The drainage-tube told the tale of hemorrhage.

The management of the vast cavity in the empty capsule must next be considered. Since there will always continue some oozing of blood, which cannot be wholly stopped, and since much bloody serum will pour out from the flayed surfaces for several days to come, it is well, when possible, to secure the exclusion of this cavity from that of the peritoneum. This may sometimes be accomplished by one of two ways.

By one way as much of the capsule as possible is cut away, and the free edge of the remnant is attached to the borders of the abdominal incision, either by special sutures or by the sutures which close up this wound. Any tear in the capsule should be sewn up on its peritoneal surface by catgut sutures. This is done, both to cut off the remnant of the capsule wholly from the peritoneal cavity, and to get rid of a hole into which the omentum or a bowel-loop might enter and become strangulated. A large drainage-tube is finally passed into the capsule, the peritoneal cavity is cleansed by irrigation, and the abdominal wound is closed. If numerous adhesions have also been severed in the peritoneal cavity proper from which oozing keeps up, another drainage-tube must be inserted into it.

The other way of excluding the cavity of the capsule from that of the peritoneum has warm advocates among the best German operators, but it is more difficult to perform. From the floor of the intra-ligamentary capsule a long-handled catch-forceps is thrust downward through the roof of the vagina, which is rendered tense by the introduction of two fingers from below. By this forceps a rubber drainage-tube with wings is seized and drawn up into the cavity. The vaginal end is wrapped up in salicylated cotton or in iodoform gauze, and the vagina loosely packed with the same material. The edges of the capsule are now trimmed, and sewn, the one to the other, by catgut sutures, and its cavity thus securely isolated from that of the peritoneum. The difficulties here lie in the depth at which one has to work, and in the patching up of a badly-torn and ragged capsule.

Whenever neither of these modes of exclusion can be adopted, because either the capsular lid is not large enough to cover its cavity, or the capsule has been too badly torn to be sewn up, a large drainage-tube, or even two of them, should be introduced into the pelvic cavity.

On the other hand, should it be impossible to remove the lower portion of the intra-ligamentary cyst from its capsule, the secreting coat should be stripped off, or thoroughly scraped, so as to remove the papillary growths. But, usually, when a portion of an intra-ligamentary cyst has been left behind, a rapid proliferation of papillomata will go on, ending after a few months in death.

Incomplete Operations.

Sometimes an ordinary intra-peritoneal cyst is so fused to the pelvic fascia or to the surrounding viscera, such as the liver, gall-bladder, diaphragm, stomach, spleen, womb, and bladder, that it would be hopeless to attempt its removal. Under such unfortunate circumstances the cyst is emptied, and an incision is made in it large enough to admit the hand. All the daughter-cysts are then crushed, and the cavity thoroughly cleansed. As much as possible of the cyst is cut away, and the remnant is stitched to the abdominal incision, which is kept open by a large cloth tent at its lower angle, or by two glass drainage-tubes, one at each angle of the wound.

Since the opening into the sac is often larger than the abdominal incision, the edges of the former are usually stitched to the latter in several isolated folds or plaits. Schroeder, however, adopted a plan which seems to me not only more neat, but also more effective, in cutting off the discharges of the sac from the abdominal cavity. The edges of the sac and of the wound are stitched evenly together on each side, from the lower angle upward to the upper angle. At this point the redundant portion of the sac—or fulness, as seamstresses call it—is taken up, or folded, in one large plait, and its edges alone are sewed together. This mode of sewing together the edges of the two wounds makes a smooth and even fit, which several isolated plaits or folds cannot attain.

Should many adhesions have been severed before it is found impossible to remove the whole cyst, all bleeding should be checked, and a careful cleansing of the peritoneal cavity made before the abdominal incision is closed. If needed, a third drainage-tube can be placed in the peritoneal cavity. This tube should then occupy the lower angle of the wound, so.that it may drain the pelvic basin.

Sometimes it may be best to tie the adherent portion in sections and to cut the free portion away. A drainage-tube must then be inserted in the lower angle of the wound. This expedient has the sanction of Atlee and Olshausen, who have reported successful cases thus treated.[1]

It is very seldom, indeed, that I do not complete an ovariotomy; but in one malignant case I adopted the following plan, which answered very well: After the daughter-cysts had been crushed and the sac cleansed, as much as possible of it was cut away. The remnant was gathered together and brought out at the lower angle of the wound. Into this was inserted a short nickel-plated steel drainage-tube of large bore, and the sac was firmly clamped to it by a small wire écraseur (Koeberlé's). Into this metal tube was passed a glass drainage-tube long enough to reach the deepest portion of the sac.

[1] *Monthly Abstract,* July, 1877, p. 334.

In such cases, when feasible, I think it would also be well to adopt Freund's plan of tying the stalk of the sac and severing it, in order to lessen the blood-supply.[1]

The drainage-tubes must be kept in until all discharge ceases. This may take from a few weeks to several months. After the first week— by which time the mouth of the sac will have become firmly united to the abdominal wall, and the sac will be securely cut off from the peritoneal cavity—antiseptic solutions may be thrown in. The best are 5 per cent. solutions of carbolic acid, claret-and-water colored solutions of potassium permanganate, and a 1 : 2000 solution of corrosive sublimate. When the discharges are offensive the injections should be made at least twice a day, and then with the two former solutions in preference to the latter. After an incomplete operation, treated by the foregoing manner, many cases recover; but a large number cannot stand the long-continued drain on their system, and die from exhaustion.

Vaginal Ovariotomy.

Sometimes, when a small cyst grows downward—beneath the broad ligament, instead of above it—and bulges into the vagina, or when a cyst of small size, especially if purulent or if dermoid, is lodged in Douglas' pouch, it may be tempting to remove it by a vaginal incision. A number of successful cases of the kind have been reported,[2] among them one of my own. No fatal cases have, indeed, yet been recorded. But the working-room is so narrow, and the impossibility of seeing what one is doing is so objectionable, that it is never likely to become a favorite mode of operation. Yet I can conceive of cases in which the removal of the cyst per vaginam might be the wisest course to pursue.

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[1] *Boston Med. and Surg. Journ.*, Aug. 24, 1876, p. 219.
[2] *Lessons in Gynecology*, 3d ed., p. 495; also *Journ. of Am. Med. Assoc.*, Oct., 1887, p. 464.

DISEASES OF THE OVARIES.

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I. BATTEY'S OPERATION.

By ROBERT BATTEY, M.D.

DEFINITION.—By the term "Battey's operation" is meant the removal of the ovaries from the human female whilst those organs are yet in a state of functional activity, with a definite object in view— viz. the arrest of the function of ovulation and the production of the change of life for the effectual remedy of otherwise incurable diseases or the pernicious consequences of malformation. There are obvious objections to coupling the name of any individual with a disease, a remedy, or a surgical operation. Men die and pass away from our sight and our thoughts, but Science is immortal. Nevertheless, in the imperfection of our knowledge and our methods it has sometimes been found difficult to affix satisfactory scientific terms, and in many instances it is convenient to use the name of an individual describer, discoverer, or inventor to convey our precise meaning. Such a case, it is believed, presents itself in this operation. Battey's operation is not the removal of an ovary simply, whether the ovary itself be diseased or healthy, and yet it may involve in the accomplishment of its true object—i. e. the change of life—the removal of ovaries either normal or abnormal in their anatomical structure. It is not, therefore, an oöphorectomy, nor is it simply the removal of appendages from the uterus; but it is a surgical procedure by which we aim to bring about a great physiological change in the system of the patient for the remedy of disease. The natural change of life which occurs at the climacteric is in no sense a "spaying" or "castration of women," and it is quite as inappropriate to attempt to apply either of these terms to the artificial change of life which attends upon Battey's operation.

HISTORY.—There has been handed down to us from a remote period as an historical fact the statement that certain kings of Lydia caused the ovaries of women to be removed, producing female eunuchs which were afterward used in their service. We are also told that a Hungarian sow-gelder nearly two centuries ago, being disgusted by the lewd

practices of his own daughter, proceeded to spay her as he was accustomed to do with the lower animals. It is impossible to say at this distant period whether or not these were cases of extirpation of the human ovary, but there are good reasons to believe they were simply cases of mutilation or excision of the external organs or pudenda.

There exists in portions of Russia and in Roumania a religious sect termed the Scoptz the members of which are said to practise as a religious rite the castration of women as well as of men. An investigation upon this subject made in the year 1873 by the U. S. consul at Bucharest[1] shows that the so-called castration of women among the Scoptz does not consist in the removal of the ovaries at all, but the mutilation or excision of the female breasts, together with the clitoris, the labia minora, and sometimes the labia majora.

Mr. Percival Pott in the last century removed both ovaries from a young woman in operating for hernia. He thus relates the case:[2]

"A healthy woman, about twenty-three, was taken into St. Bartholomew's Hospital on account of two small swellings, one in each groin, which for some months had been so painful that she could not do her work as a servant. The tumors were perfectly free from inflammation, were soft, unequal in their surface, very movable, and lay just on the outside of the tendinous opening in each of the oblique muscles, through which they seemed to have passed.

"The woman was in full health, large-breasted, stout, and menstruated regularly; had no obstruction to the discharge per anum, nor any complaint but what arose from the uneasiness these tumors gave her when she stooped or moved so as to press them.

"She was the patient of Mr. Nourse. He let her blood and purged her, and took all possible pains to return the parts through the openings through which they had clearly passed out. He found all his attempts fruitless, as did Mr. Sainthill and myself; and the woman being incapacitated from getting her bread, and desirous to submit to anything for relief, it was agreed to remove them.

"The skin and membrana adiposa being divided, a fine membranous bag came into view, in which was a body so exactly resembling a human ovarium that it was impossible to take it for anything else: a ligature was made on it close to the tendon, and it was cut off. The same operation was done on the other side, and the appearance, both at the time of operating and in the examination of the parts removed, was exactly the same. She has enjoyed good health ever since, but is become thinner and more apparently muscular; her breasts, which were large, are gone, nor has she ever menstruated since the operation, which is now some years."

[1] *Atlanta Medical and Surgical Journal*, vol. xi. p. 483.
[2] *Chirurgical Works of Percival Pott, F. R. S.*, London, 1783, vol. iii. p. 329.

In January, 1879, Dr. J. H. Aveling called attention in the *Obstetrical Journal of Great Britain and Ireland*[1] to the "substance of a paper read before the Medico-Chirurgical Society of London in 1823. This paper was entitled 'A Contribution of Experiments and Observations on Injuries of the Belly, considered in their relation to Abdominal Surgery, by James Blundell, M. D., Lecturer on Physiology and Midwifery at Guy's Hospital; communicated by J. H. Green, Esq.'" The author deduces the following conclusions:

"1st. That the generally received opinion, that inflammation in a spot of the peritoneum will almost invariably diffuse itself over the greater part of that membrane, is unfounded on truth.

"2d. That extensive divisions of the peritoneum are not of necessity fatal—that the womb, spleen, and ovaries may be taken away without necessarily destroying life."

Reasoning from these facts and observations, the author proceeds to suggest the consideration of some operations which hitherto had not been considered justifiable by British surgeons, such as a division of both Fallopian tubes, the extirpation of the healthy ovary, the extirpation of the ovarian cyst or dropsy or a portion of it, the removal of the cancerous womb, the puerperal uterus, and of part of the bladder and spleen. Blundell goes on to remark of the extirpation of the healthy ovaries: "This operation, even granting it to be safe, can scarcely in any instance be necessary, though it may be observed, by the way, that it would probably be found an effectual remedy in the worst cases of dysmenorrhœa and in bleeding from monthly determination on the inverted womb, where the extirpation of the organ was rejected."

In 1878, Prof. Hegar, then of Freiburg, published to the world, for the first time, in his work upon *The Castration of Women*,[2] an account of his fatal operation done on the 27th of July, 1872. With the body of his patient seems to have been buried the new operation, for, although he quotes freely in his work from the publications made by Battey in September, 1872, in May, 1873, in October, 1875, he does not appear to have gained courage to repeat this operation until his second case, done on the 2d of August, 1876, at which time this operation, by the energy and persistent efforts of Battey, had become widely known throughout the civilized world. The operation had been repeated many times and by a number of operators, and had already become a recognized procedure in America. But for the successful labors of Battey it does not appear that Prof. Hegar would ever have ventured upon a second attempt. After more than four years' disuse Hegar reports, in the work cited, no less than seven operations in the short space of eighteen months, clearly showing the effects of the work done in America upon Hegar's estimate of the value of the new operation.

[1] Vol. vi. p. 617.   [2] *Die Castration der Frauen*, Leipzig, 1878.

Of the claim of Mr. Lawson Tait to the origination of this operation it is difficult to speak with certainty, owing to the ambiguity of his style of writing, at one time reporting his case as a fatal one,[1] and afterward making the astonishing discovery that his patient had recovered and regained her health;[2] at one time giving to Battey the credit of priority in the publication of his original case,[3] and at another time, with equal positiveness, claiming this priority of publication for himself.[4] The history of the time shows a few unmistakable facts, viz.: 1. Mr. Tait made no publication of his case prior to May, 1879, and then made but a bare mention of his three fatal cases, without any detailed history or statement of particulars. 2. It is equally evident that Mr. Tait could not have foreseen any of the great results which were to grow out of this operation, or he would not have remained for nine years ignorant of the fate of his first patient, whether she lived or died. 3. Mr. Tait, having published in 1873 his Hastings' prize essay upon *The Diseases of the Ovaries*, certainly could not have foreseen any of these results, or he would have taken that occasion to put himself upon record before the medical world.

In strong contrast to the reticence and modesty of Mr. Tait in bringing his work in this department before the profession, stands out in bold relief the zeal and persistency manifested by Battey, availing himself of every opportunity to spread the histories of his cases before the profession everywhere, and stoutly and vigorously defending the operation against attack from every quarter. It should not be forgotten, too, that this was at a period fitly characterized by Mr. Tait himself as "perilous times"[5] with surgeons engaged in this work. It cost something then to work and to talk in support of the operation, but it needs little of either labor or personal bravery to pluck the fruit when it is ripened.

With Battey the discovery of this operation was the result of mature and deliberate thought. As early as 1866 he was charged with the care of a young lady aged twenty, apparently perfect in her physical organization, save only in the absence of her menses. The menstrual molimen had recurred at the usual intervals without any show of menstrual blood. The nervous and vascular disturbances which attended upon this failing function had broken down and destroyed her health, and she died without relief. To Battey the untoward result of this interesting case was most unsatisfactory. His investigations showed an absence of uterus, there being but a small rudimentary nodule to represent that organ. He reasoned with himself that the fatal issue of this case was due to the functional activity of the ovaries uncompen-

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[1] *British Medical Journal*, May 31, 1879, p. 813.

[2] Mr. Lawson Tait: "Table of Cases at International Medical Congress," August, 1881.

[3] Tait's *Diseases of the Ovaries*, 1883, p. 326.   [4] *Ibid.*, p. 107.

[5] *Medical News*, July 3, 1886, p. 26.

sated by the normal issue of blood. He said to himself, "If I could but remove her ovaries, stopping the function of ovulation, the balance would be restored; there would no longer be need of the function of menstruation." He diligently and anxiously searched the records of medicine for light upon this subject, but he searched in vain for any effective remedy to control the diseased condition, or for any precedent for the extirpation of the ovaries in such circumstances. Feeling within himself great dissatisfaction with the paucity of our resources under such circumstances, he inwardly determined that another such case should not die on his hands without essaying the extirpation of the ovaries in the hope of rescue.

It was not long after the fatal issue in this case that there came under his observation a young lady with persistent and long-standing amenorrhœa, whose general health was racked and broken down by a similar condition of unrelieved menstrual molimen. After long and fruitless efforts to establish the menses and to relieve the sufferings of his patient, he was forced to offer her the extirpation of her ovaries as the only remaining hope of her restoration to health. The proposition was made to the patient and her friends as the naked creation of his own brain, and it was distinctly stated to them that it was unsupported by any practical test and wholly unsupported by the authority of any recognized medical opinion. The patient was warned that she might encounter as a result of this operation the loss of many of the feminine graces; that a masculine change in her voice was possible; that the sprouting of beard upon her face was possible; that she might confidently expect to be completely unsexed by the operation. So extreme were her physical suffering and her utter despair of other relief both she and her family seized with avidity the proffered alternative in the operation.

On the 17th of August, 1872, at Rome, Ga., the operation was done whilst she was already experiencing the prodrome of a coming paroxysm. The patient having been chloroformed, the abdomen was opened three inches in the median line. The pelvis was now explored with two fingers of the left hand. The uterus in respect to its size, position, and texture appeared to be perfectly healthy. The ovaries likewise appeared healthy. There were no abnormal adhesions of the pelvic organs. To the right of, and behind, Douglas' fossa was a fibrinous deposit, probably the remains of abscesses in that region which had discharged by the rectum and vagina. The right ovary was quickly brought to the light between two fingers and examined. Upon its upper and posterior surface was distinctly marked a freshly-ruptured Graafian vesicle, with a small drop of yet liquid blood exuding from the point of rupture. It seemed as though the ovum had but just escaped. The base of attachment to the broad ligament was transfixed at the centre with a needle carrying double silk, and tied in two equal

halves. The left ovary was now searched for and seized over the ramus of the pubis at the left inguinal ring. Upon its surface it presented likewise the marks of a recently-ruptured Graafian vesicle, with a spot of darker-colored and coagulated blood in the point of rupture. It appeared probable that two, possibly three, days had elapsed since the escape of this ovum, but certainly not five weeks, to correspond with her last paroxysm. The pedicle of the left ovary was ligatured in like manner as the other. The ovaries having been previously cut away, the ligatures were cut short and the pedicles allowed to drop back into the pelvis. There was a little oozing of blood-stained serum, which was carefully sponged out, and the walls of the abdomen were brought together by three deep silver-wire sutures, including the peritoneum, and secured by compressed shot. Eight superficial sutures completed the closure. No attempt was made at any special antiseptic precautions in the operation. The patient was put to bed in one hour from the commencement of the chloroforming. On the second day the weather became intensely hot, and so continued up to the fourteenth day, without a drop of rain to cool the burning earth, the thermometer ranging from 90° to 98° Fahr. in the shade. She had some septic complications, but was out of bed on the sixteenth day, and made a good recovery.

In the following month a detailed history of the operation was published by Battey in the *Atlanta Medical and Surgical Journal* for September, 1872, with the statement, "As far as my means of information enable me to judge, this operation is unique in the annals of surgery, the nearest approximation to it being the celebrated case of Percival Pott, which is so distinctly stated in his *Chirurgical Works* that I may well close my report by its recital."

THEORY OF THE OPERATION.

From an early period in the history of medicine physicians have encountered a variety of diseased conditions connected more or less directly with the functions of ovulation and menstruation in women, which have proved rebellious to all remedies; and it had grown to a custom to encourage such invalids to bear as best they might their sufferings, alleviated by such means as the existing state of the art afforded, looking forward hopefully to the climacteric period, when the natural change of life might be expected to remove the cause of their sufferings and restore them again to health. Not unfrequently these expectations were realized. In many cases death relieved them of suffering before the climacteric could come to the rescue. In very many serious structural lesions would intervene and render Nature's cure impossible. Battey reasoned with himself, If the change of life is to be relied upon

as the only hopeful remedy, why not have it now by the hand of art, instead of waiting long years for its natural occurrence? He foresaw that there must be a variety of diseased conditions which could be, and ought to be, remedied by the establishment of the artificial menopause. He reasoned, further, that the extirpation of the ovaries by arresting the function of ovulation would likewise arrest the function of menstruation and produce an artificial change of life, with all the nervous and nutritive changes which attend upon the natural change of life. The prime object, therefore, which he had in view was the production of the artificial change of life, and not simply the removal from the body of a diseased organ. Experience, however, in the use of the operation very soon showed that the ovaries removed were not healthy, but diseased in their anatomical structure.

INDICATIONS.—From the very inception of the operation Battey foresaw that the field for its usefulness must be a somewhat varied one, as the variety of cases in which physicians were accustomed, in the paucity of their resources, to invoke the natural change of life as the only hopeful remedy covered quite a number of diseased conditions. He therefore formulated the proposition that this operation is indicated in any grave case of disease which is either dangerous to life or destructive of health and happiness—which is incurable by the recognized resources of our art, but which we may reasonably hope to cure by the change of life. It was his custom, in the selection of suitable cases for operation, to ask himself three questions: 1st. Is this a grave case? If the answer be Yes, then, 2d, Is it incurable by the recognized resources of our art? If the answer be Yes, then, 3d, May we reasonably expect to cure it by establishing the change of life? If the answer still be Yes, then the case is a suitable and proper one for the operation. After the lapse of years and with his riper experience he is still accustomed to select his cases by the same unerring formulary. If he be asked, " Is the operation indicated for dysmenorrhœa? for uterine and ovarian displacements? for menorrhagia? for uterine myoma? for nymphomania? for oöphoro-mania? for oöphoro-epilepsy? for malformations of the uterus and vagina?" he answers both Yes and No. The operation may be indicated in certain cases under each and all of these headings, and contraindicated in other cases of the same.

METHODS.

The ovaries may be removed either by the abdominal incision or by opening the posterior vaginal cul-de-sac into Douglas' space.

VAGINAL METHOD.—The patient is placed in the semi-prone posture of Sims, and the perineum retracted by Battey's modification of the Sims speculum, consisting of a short, slightly-cupped blade mounted

upon a secure handle and bent to an angle of 45° with the handle, in

Fig. 290.

such manner as to press the posterior vaginal wall well back into the hollow of the sacrum, and give ample room for the incision between the point of the blade and the uterine cervix. The cervix uteri is now seized with a stout vulsellum and dragged well down under the arch of the pubis. With a small tenaculum and scissors the posterior vaginal cul-de-sac is opened the distance of one inch in the median line, and the incision extended into Douglas' space. The index finger is now passed up the posterior wall of the uterus, and swept across upon either broad ligament to examine the condition of the ovaries, to rupture adhesions, and to guide the introduction of a placenta-forceps, with which the ovary is seized and brought down into the vagina. The organ may be removed by throwing around it the chain of an écraseur and very slowly crushing the pedicle of attachment, or the pedicle may be transfixed and tied in two parts with carbolized silk, when the ovary is cut away with scissors; and the opposite ovary is brought down and dealt with in the same manner. Experience has shown in a number of cases that the écraseur may be safely trusted where the vaginal opening remains for drainage. If any undue oozing of blood occurs, a small lump of ice slipped through the incision into the cul-de-sac quickly stops it, or it may easily be controlled by irrigating Douglas' space with hot water. It is important that the crushing of the pedicle should be done very slowly, to avoid hemorrhage.

Battey's Modification of Sims' Speculum.

Experience has shown that it is unnecessary to suture the incision made in the vaginal operation, as it speedily contracts down to a small opening, and in no instance has there been protrusion of bowel through it. When the speculum is withdrawn, the uterine cervix forms a sufficient obturator for the opening. It was formerly supposed that the vaginal method of operating offered special advantages, in that the tissues incised were thin, in that the pelvic peritoneum was supposed to be less prone to grave peritonitis, in that atmospheric air was not admitted to the general cavity of the abdomen, and especially in that the dependent position of the opening was highly favorable to drainage of liquids from the cavity. It is now doubtful whether any of these supposed advantages really exist in point of fact. The objections to the vaginal method are—1st. We are liable to encounter extensive and firm adhesions, and also hydrosalpinx and pyosalpinx, which in many instances cannot be satisfactorily dealt with through the vaginal opening. 2d. During the operation uterine and vaginal secretions are carried into Douglas' cul-de-sac by the finger of the operator. The open-

ing made is situated behind the os uteri, and when the patient is placed upon her back in bed the inclination of the vaginal canal backward and downward tends to gravitate these secretions into the wound. 3d. It is not practicable in this method of operating to carry out successfully the antiseptic precautions.

ABDOMINAL METHOD.—The patient is placed upon a narrow cushioned table before a window, her feet resting in a chair. Having been anæsthetized, the incision is made, in the median line, of such length as to permit, when all bleeding has been stayed, the opening of the peritoneum one inch and a quarter, which may afterward be extended if found necessary. The index finger is now passed in behind the body of the uterus and swept to the right and left to ascertain the precise position and condition of the ovaries and tubes. If these are found to be adherent, the lymph-deposits are carefully broken up by the finger and the ovaries freed, when they are successively brought into view, the finger being placed upon one side of the ovary and the fenestre of Sims' depressor on the other; or, guided by the finger, the ovary is seized and brought out with a suitable forceps.

If there be pyosalpinx or hydrosalpinx or the tube be firmly adherent to the ovary, it should be removed with it. The pedicle is transfixed with a ligature of carbolized silk and tied upon either side. The ends of one of the ligatures are passed around the entire pedicle and tied for additional security. The ligature should be placed well down upon the broad ligament in order to leave sufficient tissue in the distal portion to prevent slipping of the ligature.

Great care should be used, in cutting away the ovary, to remove every particle of its stroma. A small sponge mounted upon a holder is now passed gently down into the bottom of the cul-de-sac to ascertain if there be blood lodged there, which should be carefully washed out. If a cystic ovary shall have burst in the manipulation, discharging any portion of its contents into the abdominal cavity, or if there should be persistent oozing from ruptured adhesions not readily and perfectly controllable, it is better to lodge an aseptic drainage-tube of rubber in Douglas' space, to be secured in the lower angle of the wound. The abdominal walls are brought together with deep sutures of carbolized silk, two or three to the inch, and intervening superficial sutures uniting simply the edges of the skin. In lodging the deep sutures the needle is entered the third of an inch from the incision, and transfixes the skin, cellular tissue,

FIG. 291.

Sims' Depressor.

the edge of the conjoined tendon, and the peritoneum, and the similar structures upon the opposite side, in such manner that when the sutures are tied the severed edges of these several structures will be brought

Fig. 292.

Fenestrated Forceps.

closely in contact. The wound is dressed with carbolic cerate along the line of incision, covered by a good pad of absorbent cotton held in place by a flannel bandage, with perineal straps to prevent the bandage from slipping upward.

AFTER-TREATMENT.—In Battey's operation, if the surgical procedure has been strictly aseptic, as it should be, the after-treatment consists more in the judicious refraining from officious intermeddling than in any active interference. The use of opium, aside from securing rest from severe pain, is not curative in these cases, and the administration of quinine, veratrum, or calomel is rarely beneficial and usually only injurious. Simple purgatives, by opening the alimentary canal and removing any remaining fæces, and by setting up a process of excretion of morbid materials from the blood, are especially useful. The surgeon cannot too thoroughly understand that when the operation is finished and his patient put to bed the issue of the case for life or for death is, for the most part, already determined. Woe be to him who neglects the proper cleansing of the abdominal cavity in the hope of supplying the deficiency by subsequent eliminative medication!

The patient is put to bed upon the back, the knees drawn up, supported by a cushion, and the position occasionally changed to either side. The use of opium is to be avoided, except as may be actually necessary to allay severe pain. When used, the elixir by enema is to be preferred. The stomach is kept empty for twelve to twenty-four hours, when small draughts of hot water may be allowed, to be followed subsequently by lime-water and milk. The use of ice is rarely beneficial. It but serves, in the reaction which follows, to produce a burning thirst, which continuously calls for more, until the overloaded stomach rejects the accumulated liquid. Not unfrequently, the urine is voided normally. When the catheter is used it is well to avoid its frequent introduction ; an interval of eight to twelve hours may ordi-

narily be allowed. In the evening of the third day a gentle but efficient purgative should be given, bearing in mind the fact that Nature splints the bowels after these operations, and larger than ordinary doses of purgatives are required. One or two grains of aloin in gelatin-coated granules, or full doses of Crab Orchard salts in combination with Seidlitz, are usually well borne and prove to be efficient. When the nausea and vomiting are urgent and purgatives cannot be borne upon the stomach, enemata of castor-oil emulsion or of infusion of senna may be substituted.

The bowels having been well moved and flatus expelled, the deep sutures should be withdrawn upon the fifth day, leaving to the tenth or twelfth day the superficial sutures uniting the edges of skin. In general, on the fifteenth day the patient is allowed to sit up, and upon the twenty-second day may be discharged if her home be near at hand, otherwise retained to the end of the fourth week. The abdominal bandage should be continued for three or four months after her discharge. Care in the selection of the diet should be observed for a period of at least two months following the operation.

RESULTS.

Upon the third or fourth day after the operation there appears, with great uniformity, a discharge of blood and mucus from the uterus of the same characters presented in the normal menses. This discharge occurs equally, though the normal period of menstruation may be due within a few days or not until three weeks have elapsed. It is evidently the result of the operation, and not a recurrence of the natural menses. It is, then, a metrostaxis, and not menstruation. Ordinarily there is no subsequent recurrence of this phenomenon, but in exceptional cases it may show itself after the lapse of four weeks, and may continue its monthly recurrence for a number of months or even years. In some cases there is a cessation of this discharge for several months, when it may recur once or twice or even many times. Whether this pseudo-menstruation be dependent upon the presence of a supernumerary ovary or is merely due to the periodical congestion of the uterine mucosa, kept up by long-established habit, is not yet definitely determined. Where portions of ovarian stroma have been left behind in the pedicle, the ovaries having been incompletely removed, it has been predicted that menstruation would be regularly continued ; and the prediction in every such instance has been verified. In one notable case not only has the leaving of a small portion of ovarian stroma kept up for years the regular recurrence of the menses, but the health of the patient has been completely restored, and a healthy child was born two years after the operation.[1]

[1] *Transactions International Medical Congress*, London, 1881, vol. iv. p. 288.

It is interesting to observe in a case of chronic oöphoritis attended by great ovarian pain and the formation of the morphine habit, an exploratory incision was made, and adhesions of a formidable character encountered upon both sides, which seemed to preclude the idea of extirpating the organs. The abdomen was therefore closed without disturbing the parts more than simply to diagnosticate the case. The patient got up quickly from the exploration, and, believing that her ovaries had been removed, her pain disappeared, and with it the menses. She promptly gave up the use of morphine and enjoyed excellent health for the space of six months following upon the operation, when the menses returned, and her old pain as well, and she again resumed the use of morphia. Subsequently a determined effort was made for her relief: the firm adhesions were broken up and the ovaries and tubes thoroughly removed and a complete cure effected.

It has been claimed that the removal of the tubes along with the ovaries ensures the complete menopause, but experience has conclusively shown that the claim is unfounded.

In this connection it may be observed that the ratio of cases of this pseudo-menstruation noted in the experience of Battey[1] after the removal of both ovaries does not greatly exceed the relative proportion of cases of supernumerary ovaries found in women examined by Beigel.

Of the risk to life which attends upon this operation it is difficult to speak with precision. In the hands of different operators, even men of acknowledged experience and skill, the death-rate has varied very widely. It may be fairly stated, however, that in skilled hands, with favorable surroundings, the mortality would not ordinarily exceed two or three in the hundred.

The object of this operation being to cure disease through the physiological revolution which takes place in the female organism at the change of life, it is not to be expected that the remedial effects of the operation will be secured at once. In some exceptional cases, however, this does occur, and the patient passes promptly from a condition of great suffering into one of comfort and happiness. In general, however, the change is a gradual one, passing through many months, and two, three, or even five, years may elapse before the beneficial results of the operation are fully realized. In some instances, so great is the breaking-down of the nervous system by long years of suffering, the case becomes absolutely incurable by this or any other known means. To render the cure effective, therefore, whilst we are, upon the one hand, to be well assured of the necessity of the operation before essaying it, we should not be unmindful of the fact that long years of delay may render it ineffectual.

It was formerly supposed that extirpation of the ovaries in the

[1] *Transactions of the American Gynecological Society,* 1887.

human female would be followed by the loss of many of the feminine graces and the taking on of certain characteristics of the male, such, for instance, as a masculine voice, the sprouting of beard upon the face, atrophy of the mammary glands, loss of the graceful rotundity of the female figure, etc. Such a supposition is not founded in correct physiological reasoning, for, whatever changes might be supposed to result from the operation, they must be of a negative character, and could not eventuate in implanting upon the female organism the positive characteristics of a man. It was supposed also that such mutilation would not only deprive woman of her childbearing power, but would also completely unsex her and unfit her for the duties of a wife. Experience has now abundantly shown that all these suppositions are founded in error, for the loss of the ovaries does not in itself produce any of these supposed results, but the subjects of it, when recovered in health, become in many instances splendid specimens of perfect womanhood, save only in the loss of the normal menses and the power of procreation.

Of 54 cases in his private practice carefully followed up from one to ten years by Battey, there were cured 33; much improved, 8; little improved, 5; not improved, 8. There was complete menopause in 50, and pseudo-menstruation in 4. In 2 of the latter the tubes were also removed, and in 2 they were not.

II. DISEASES OF THE OVARIES.

By HENRY C. COE, A. M., M. D.,

While a careful examination of a Fallopian tube can hardly fail to reveal the presence of an existing deviation from the normal, however slight, in the case of the ovary the pathologist is frequently at a loss as to how he may interpret the changes which he finds. The tube is quite simple anatomically. It is merely an offshoot from the uterus; but the ovary is an exceedingly complex organ, about which much remains to be learned. If any one doubts this fact he has only to refer to the literature of the subject, when he will find that two equally competent observers not only describe different histological appearances in ovaries that are to all intents similar, but that even if the same objects are discovered within the stroma their presence is explained differently. While it is true that an ideally normal ovary is not often encountered, at least in a subject who has reached puberty, it is equally true that we may be mistaken in assuming that certain microscopical changes in the gland are of a morbid character.

Several factors conspire to render the ovary peculiarly susceptible to inflammation, either primarily or more often in connection with affections of the other pelvic organs. A reference to the description of its internal anatomy will make it sufficiently clear that the vascular and nervous supply is so rich and intricate that a frequent disturbance of its delicate adjustment seems almost inevitable. The periodical enlargement of the normal gland not only appears to favor the development of morbid conditions, but aggravates disease after it has once become established.

Physiological rest is as impossible for the ovary as it is for the spleen, and for similar reasons. It is constantly enlarging and diminishing as the result of variations in the blood-supply. Not only is the entire organ liable to engorgement, but the existence of localized foci of disease is possible, the Graafian vesicle being liable to be affected when no marked changes can be found in the surrounding stroma.

Besides what may be termed the intrinsic causes of inflammatory conditions in the organ, its environment is such that it readily shares in disturbances in adjacent viscera. It is unnecessary to refer to the intimate relation which exists between the plexuses of nerves and vessels of the broad ligaments, and to call attention to the fact that any obstruction to the circulation means congestion of the uterine appendages; it is equally superfluous to remind the reader that the obscure reflex neuroses which frequently accompany ovarian disease are explicable by reference to the communication of the pelvic plexuses with

those of the general sympathetic system, while neural influences may preside over organic changes in the gland in some manner as yet unknown.

The anatomical relations of the ovary render it peculiarly vulnerable; surrounded as it is by peritoneum, lying in the folds of the broad ligament—a region constantly the seat of localized inflammation—it may either share in inflammatory processes or may be surrounded by adhesions. The intimate relation of the tube to the ovary, and the continuity of the lining membrane of the former with that of the lower genital tract, constitute, according to recent authorities, one of the most common causes of oöphoritis. That salpingitis can exist without disease of the corresponding ovary is not certain; that they are frequently associated is a fact of daily observation. That diseases and displacements of the uterus may be the direct cause of ovarian affections is almost self-evident.

It is rarely possible to trace the chain of causes in morbid conditions of the ovary. Given a cirrhotic or cystic organ buried in a mass of adhesions, the results of a former peritonitis—did the inflammation begin in the ovary itself or in its environment? Was the morbid process centrifugal or centripetal? This is a question which the pathologist is often unable to decide, in spite of the importance which is assigned to salpingitis as a cause of pelvic peritonitis. In short, while we have seen that the ovary is exposed to disease through many different channels, it is difficult to affirm which causes were at work in any particular case.

Ovarian Hyperæmia and Hemorrhage.

Etiology.—Hyperæmia of the ovary occurs physiologically during menstruation and sexual excitement; being a relative condition, it is easy to see that a degree of congestion which would be innocuous in one individual might in another give rise to symptoms of a pathological character. Minor abnormalities within the ovary (localized indurations, cortical thickening, etc.) or the presence of slight peri-oöphoritic adhesions may cause such a disturbance of the inflow and outflow of blood as to give rise to intense hyperæmia when from any cause the pelvic organs receive a sudden increase of their ordinary supply. Chronic oöphoritis and displacement of the ovary on the one hand, and violent or excessive sexual intercourse on the other, are factors which are especially active in bringing about this condition. Masturbation and ungratified sexual appetite directly favor ovarian congestion; sudden suppression of the menses from cold or nervous shock is doubtless a cause. Intense hyperæmia of the glands is commonly found in the bodies of subjects dying with acute general peritonitis, even where

there are no surrounding adhesions or accompanying tubal disease; here it is merely a local expression of the general congestion.

Hemorrhage limited to a few follicles represents simply a local exaggeration of the general ovarian congestion; the follicle may have been enlarged in consequence of pathological processes, which would also tend to lessen the resistance of the vessel-walls, and thus to favor rupture under increased pressure. Torsion of the ovary may result in passive hyperæmia and follicular apoplexy, even in subjects of tender age; it is said to occur most frequently in cystic ovaries. It has been noted in heart disease and in cases of cerebral hemorrhage. General follicular hemorrhage is an expression of dissolution of the blood, and is accompanied by ecchymoses and hemorrhages from mucous surfaces. Typical cases are seen after extensive burns, phosphorus-poisoning, typhoid fever, etc. Extensive primary stromal hemorrhage is rare, except as an accompaniment of a general blood affection, such as scurvy. It is more apt to result from the rupture of a deep-seated hemorrhagic follicle. Punctate extravasations are seen in connection with either active or passive hyperæmia.

ANATOMY.—The writer has seen a few specimens of ovaries which could fairly be regarded as the seat of simple hyperæmia. They were examined immediately after removal; one typical example presented the following appearances: It was slightly enlarged, more spherical in shape than usual, of a softer consistence than the average normal organ, the cortex having a purple color; the fimbriated extremity of the corresponding tube shared in the congestion. On section the cut surfaces presented a general deep pinkish hue, the vessels being unusually distinct, suggesting those seen on the periphery of a congested kidney. The most characteristic feature of the specimen was the œdematous condition of the stroma, which recalled that of a "wet brain." There was nothing especially striking about the microscopical appearances of the ovary, except that in a few spots there were undeniable evidences of ectasis and extra-mural collections of blood-cells, such as would have been found in any other highly vascular organ under similar circumstances. Neither the stroma nor the Graafian bodies presented any marked deviations from the normal.

HEMORRHAGE INTO THE OVARY.

This may vary from a microscopical collection of blood-cells (really a diapedesis) to a true hæmatoma as large as a hazelnut, or even larger. For the sake of convenience we may regard the hemorrhage as follicular or interstitial. The first variety is easily explained. Hyperæmia and rupture of the peripheral vessels of the ripe vesicle is the physiological culmination of the menstrual nisus; excessive congestion

and the escape of blood from the larger deep-lying veins into one or more unruptured vesicles represent deviations from the normal. Although this accident doubtless occurs, as a rule, during the monthly period, it is evident that any local causes which determine an excessive flow of blood to the gland may be held responsible for it (violent or excessive intercourse, ungratified sexual desire, etc.), while the factors which lead to localized hemorrhages in other organs (obstruction to the general circulation, profound alteration of the blood from disease or noxious drugs) are equally active here.

The writer is inclined to believe that follicular hemorrhage is of comparatively common occurrence, but that it is necessary to exercise some care in discriminating between the normal and the abnormal; that is, between the small clot formed in a ruptured vesicle after the escape of its contents and the large coagulum which represents an excessive escape of blood after rupture. Where the vesicle is unruptured the diagnosis will be plain. In other cases the size and position of the clot, the presence of the corpus luteum, and the absence of other hemorrhages will point to the true condition. The escape of blood may be secondary to the enlargement of the Graafian body; in other words, the hemorrhage may take place into a cyst. A microscopical examination of the fluid might throw light upon this point.

The gross appearance of an hæmatoma ovarii is characteristic (Fig. 294). The organ is enlarged and irregular in shape, the irregularity being due to the projection above its surface of one or more dark-red or purple bodies, varying in size from a pea to a hazelnut, or even a pigeon's egg. If one of these cysts has ruptured, a portion of its contents may have escaped into Douglas' pouch, forming an hæmatocele, or adhesive inflammation may close the opening in the sac. Follicular hemorrhage is doubtless a frequent cause of intra-peritoneal hæmatocele, which may terminate fatally at once or from subsequent peritonitis. Scanzoni reports the case of a young girl who died from hemorrhage from a ruptured ovisac, six pounds (!) of blood having escaped into the peritoneal cavity.

FIG. 293.

Follicular Hemorrhage of the Ovary: death from extensive burn (Winckel).

When fresh, the contents of an unruptured cyst consist of dark fluid blood; this rarely forms a true clot, as in a ruptured ovisac, but gradually assumes a chocolate color and a honey-like consistence, similar to that of the contents of the multilocular cystomata. The writer has found such a collection of fluid in the centre of an ovary, where it had doubtless existed for a long time without any signs of absorption. In

the course of time the contents of the cyst may be so far absorbed and disintegrated that nothing remains to mark its site but a small collection of granular pigment, or the coloring matter of the blood may be absorbed and a turbid serous fluid may remain. The peculiar fatty degeneration of the corpus luteum is absent.

It is claimed by some pathologists that follicular hemorrhage is a

Fig. 294.
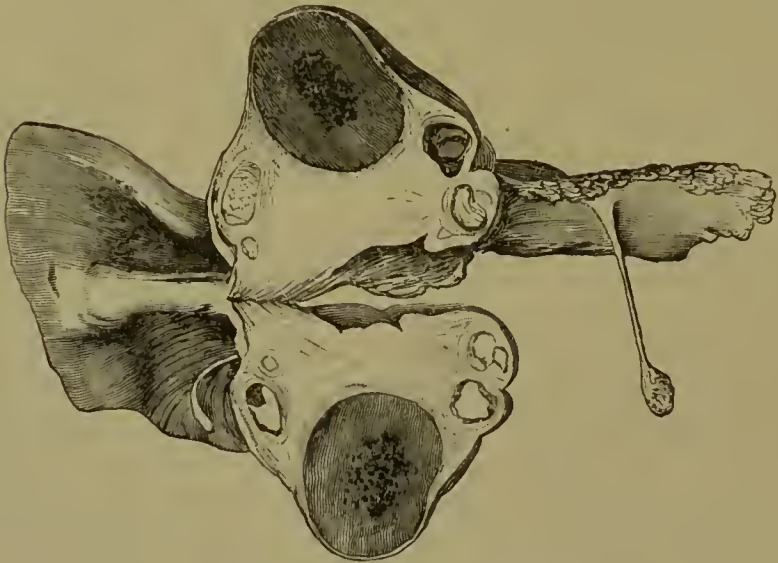
Hæmatoma of Right Ovary (Winckel).

cause of cystic degeneration, but it seems more rational to regard it as a secondary accident. The writer has never been able to find the site of the ruptured vessel in the cyst-wall.

Hemorrhage into the stroma is of rare occurrence in comparison with the foregoing. It may be primary (the result of venous congestion) or secondary to follicular apoplexy; the latter condition would be suspected if a single collection of blood was found near the periphery of the organ, even when the remains of the cyst-wall had disappeared, while the former would be indicated by numerous punctate hemorrhages more central in their location and associated with general vascular engorgement and œdema. Extensive primary hemorrhage at a single point in the stroma is certainly very rare, if it occurs at all; specimens have been removed from subjects dying of scurvy and typhus in which the entire ovary was transformed into a mass of coagulated blood, but the change doubtless began by the occurrence of minute apoplectic foci, which eventually coalesced to form a single collection of blood. In the course of the diseases mentioned, in which general disintegration of the circulatory fluid occurs, there may be no actual rupture of vessels, but simply a general sweating, so to speak, through the

vascular wall, so that, in the words of Olshausen, "the entire stroma is like a sponge saturated with blood." In this case the ovary merely shares in the general ecchymotic condition; the element of increased pressure or congestion is not especially prominent.

It is probable that excessive hyperæmia, such as is induced by more or less complete obstruction of the venous return, may culminate in ovarian apoplexy; such a result would be more likely to follow obstructions from local causes (pressure of tumors, pelvic adhesions, etc.) than from diseases which produce general circulatory disturbances (cardiac, pulmonary, or hepatic lesions, malignant disease of the omentum). Possibly the axial rotation of enlarged ovaries may account for hemorrhage the origin of which is otherwise unknown. From the occurrence of hæmatoma ovarii in connection with marked ovarian and tubal disease it is fair to infer that the latter bears a direct causal relation to it; in fact, some of the complex symptoms observed at the time of menstruation in patients with recognized disease of the appendages, especially transient evidences of collapse, may be due to periodical intra- as well as extra-ovarian hemorrhages. With our present indefinite knowledge concerning the relation between ovarian symptomatology and pathology we can only indulge in speculations on this subject. Since stromal hemorrhage has been observed in the fœtus (as in a case reported by Schultze), it is evidence that its origin is often entirely unknown.

The anatomical appearances of ovaries that are the seat of old or recent stromal apoplexy vary according to the severity of the lesion. The organ may be of normal size, or but slightly enlarged, and may present on median section only a general reddish hue, such as is observed in hyperæmia, with here and there a minute reddish point that represents a collection of blood. Under the microscope the vessels will show local dilatations, with occasional extra-mural groups of red disks or blood-pigment. The rather common occurrence of the latter in ovaries that present no marked evidences of disease leads to the inference that localized hemorrhages or extravasations are not infrequent, and possess but little pathological significance.

SYMPTOMS.—The symptoms of this condition are those of hyperphysiological pelvic congestion *plus* certain disturbances referable to the ovary. Menorrhagia in a young, ardent unmarried woman (who complains of no pelvic trouble except at her periods), associated with throbbing pain in the region of the ovaries and various reflex disturbances (pelvic and mammary neuralgiæ and pain extending down the back of the thigh), may be regarded as indicative of ovarian hyperæmia. The important points are the acute nature of the symptoms, their sudden development at the menstrual period, or in connection with pelvic congestion from other causes, the locality and character of the pain,

and the absence of symptoms of oöphoritis or peri-oöphoritis (rise of temperature, etc.). This condition may be suspected in newly-married women, previously healthy, who exhibit symptoms such as have been described. The dyspareunia and ovarian hyperæsthesia sometimes seen in young prostitutes is doubtless referable to the state of chronic congestion in which their ovaries are kept; in the latter class of patients, however, the pre-inflammatory stage is soon passed.

Hemorrhage into the ovary gives rise to symptoms only when rupture occurs. According to the amount of blood which escapes into the peritoneal cavity, the patient's condition varies from one of moderate shock to alarming collapse. As before remarked, it is probable that some of the obscure attacks of pain and transient collapse in patients at the menstrual period, who recover perfectly without subsequent peritonitis or evidences of tubal trouble, are due to small hemorrhages from the rupture of sanguineous cysts, the blood from which is rapidly absorbed by the peritoneum without leaving any traces, just as the venous oozing after laparotomy is innocuous, even though one or two ounces of blood may collect in Douglas' pouch.

The rupture of a large hæmatoma ovarii may be followed by a rapidly fatal result, as in a case reported by Boivin and Dugés, where the patient was suddenly seized with violent pain in the abdomen, collapsed, and died in a few hours, about fifty ounces of blood having escaped into the peritoneal cavity from the ruptured ovary. The symptoms under these circumstances will be those of hæmatocele.[1]

DIAGNOSIS.—The diagnosis of ovarian hyperæmia is mainly a matter of inference, depending upon the previous history of the patient (with regard to the absence of previous ovarian trouble) and the sudden development of ovarian pain and tenderness in connection with intense pelvic congestion, as shown by menorrhagia, especially at the menstrual period. The local examination may or may not serve to confirm the opinion derived from the clinical history. Under favorable circumstances the ovary may be found by bimanual palpation to be enlarged and extremely tender. Pressure upon it aggravates the pain, and may lead to increased excitement and reflex symptoms. The absence of evidences of an acute inflammatory process is of some value.

Secondary congestion in chronically diseased ovaries may be inferred from signs of periodical local disturbances, tubal disease being excluded. In cases of disease resulting in dissolution of the blood the sudden appearance of ovarian pain, associated with the development of a movable tumor at the site of the ovary, would point at once to general follicular apoplexy. The shape and position of the tumor distinguish it from a small hæmatocele between the folds of the broad ligament; such a collection of blood would be less circumscribed, and would

[1] See Vol. I. pp. 745 and 749.

tend to gravitate to the base of the ligament. Hemorrhage may take place into a small ovarian cyst or cystic ovary, but in this case the existence of ovarian disease and enlargement would probably have been noted previously. The sudden development of symptoms of internal hemorrhage in a case of this kind must leave little doubt as to the occurrence of rupture of an hæmatoma ovarii, although, under the influence of the menstrual nisus, the source of the hemorrhage might lie external to the ovary—in the veins of the pampiniform plexus, etc.

PROGNOSIS.—In young girls whose ovaries are anatomically sound abnormal congestion may be corrected before the occurrence of organic changes. In women who practise sexual intercourse habitually, even under lawful conditions, the prognosis is less hopeful unless a complete and sufficiently prolonged cessation of disturbing influences can be effected. Pregnancy may effect a cure, but this cannot be predicted with certainty. Even when uncomplicated, prolonged hyperæmia may result in acute oöphoritis, or more often in chronic disease of the ovaries, which completes the vicious circle by increasing in its turn the periodical congestion which originally led to it. When localized peritonitis and tubal disease are superadded the patient's condition is discouraging.

TREATMENT.—This is mainly prophylactic, but varies with the age and character of the patient. If a young girl manifests precocious sexual activity and a tendency to hyper-physiological monthly congestion, this should be corrected by the formation of proper mental as well as physical habits. Vicious practices, especially masturbation, should be eliminated, as well as such books and associations as tend to inflame the passions. Perfect rest should be enjoined just before and during the first day or two of the menstrual period. A combination of the bromides will be found to be useful to allay ovarian congestion; menorrhagia is seldom so severe as to require the administration of ergot, hydrastis, or dilute sulphuric acid. The use of opium or stimulants is seldom advisable, as the habit of taking them at every period may readily be formed at an early age. A small blister may be applied over the tender ovary, but other local treatment is inadvisable in the case of young girls, whose thoughts should be directed as much as possible away from their pelvic organs. Constipation should be carefully avoided. Arsenic and strychnine are good general tonics. Marriage offers a natural means of cure in cases of hyperæmia due to ungratified sexual desire, where the trouble is not attributable to actual organic disease of the ovaries. In married women the temporary suspension of marital relations is often necessary. Hot vaginal douches and the usual astringent or alterative applications to the fornix, adjacent to the affected organ, are valuable adjuvants in the treatment. The direct application of a mild constant current has given satisfactory results in these cases.

Acute Oöphoritis.

Etiology.—Acute inflammation of the ovary is usually secondary to inflammation of the surrounding tissues, although in a certain proportion of the cases it originates within the gland. Primary oöphoritis, as will be inferred, being an inflammation beginning in the depths of the stroma, must be ascribed to some circumscribed vascular disturbance, or it may be the local expression of some general infection. Follicular or parenchymatous oöphoritis is not seldom observed in the acute exanthemata, in cholera, in septicæmia, and after phosphorus- and arsenic-poisoning. One or both ovaries may be affected. Extensive inflammation of the stroma as the result of general infection is rare outside of the puerperal state; it is sometimes found in cases of septic peritonitis where the absence of peri-oöphoritis shows that the trouble has originated within the gland itself.

Sudden suppression of the menses as a result of cold certainly gives rise to hyperæmia and acute inflammation of the ovaries, which in a few cases may result in abscess. Gonorrhœa has been mentioned as a not infrequent cause, but the ovarian trouble in the case is clearly secondary to disease of the tubes. Sexual excess leads to congestion and subsequent inflammation of the glands, as those will testify who have frequent opportunities to examine young prostitutes where gonorrhœal infection can be excluded.

Acute oöphoritis is often secondary to disease of the tubes and peri-oöphoritis, the sequence being clear. In cases of death from diffuse peritonitis following septic infection of wounds in the lower genital tract, the ovaries will frequently be found to be the seat of acute suppurative inflammation. This is the usual history of the fatal results of minor operations, such as the passage of a sound, curetting, incision of the cervix, hystero-trachelorrhaphy, etc. The presence of recent peri-oöphoritis points to the secondary nature of the affection. Pyosalpinx is sometimes accompanied by this condition of the ovaries; abscess is present more frequently than was formerly supposed. However, the ovarian trouble is more often of a chronic character, being due to long-continued pressure from old adhesions.

Puerperal oöphoritis is the most common variety. It may be primary, being an expression of the general septic infection, or may be secondary to general peritonitis. It is usually bilateral, and often results in complete necrosis of the organ and abscess-formation. The inflammation of the tubes may be insignificant (catarrh) as compared with the virulent processes in the peritoneum and ovaries.

Anatomy.—Pathologists recognize two varieties of acute inflammation of the ovary—the follicular and the interstitial. It is safe to affirm that a sharp distinction between the two can only be drawn in

the lesser degrees of the affection, since the stroma and ovisacs are so intimately related that one shares in any suppurative process in the other.

In the mildest form of follicular inflammation the primordial follicles alone are involved, the stroma surrounding them being slightly hyperæmic, but otherwise unchanged. The liquor folliculi becomes turbid. On microscopical examination the epithelial cells are seen to have undergone cloudy swelling and present a granular appearance, and the zona pellucida is somewhat thickened. The destructive character of the process is indicated by granular degeneration of the ovum and disappearance of the germinal vesicles. The size, consistence, and external appearance of the ovary are unchanged. When the inflammation is more severe and general many or all the ovisacs are affected ; when the gland is somewhat enlarged (rarely to such an extent as to be recognized clinically) and feels softer than usual, it presents on inspection the same appearance as in hyperæmia ; if there is suppuration of the superficial ovisacs, localized peri-oöphoritis may be present, a layer of organized lymph being deposited over the inflammatory foci. On section the stroma presents a general congested appearance, the fine vascular networks being injected, especially in the immediate vicinity of the inflamed follicles. It is but a step from this stage to interstitial oöphoritis. The liquor folliculi is transformed into a puriform fluid. A section of a suppurating follicle shows the following changes : The membrana propria is thickened, while the granulosa has almost entirely disappeared, its degenerated epithelium being largely replaced by young cells. The contents vary from a cloudy fluid loaded with granular débris to true pus. Slavjansky[1] regards hemorrhage into the diseased ovisacs as a rare sequela ; extravasations, if they occur, are limited to the granular layer, the admixture of blood in the liquor folliculi being accidental, and coming from the vessels divided in cutting the section (?). In the ring of stroma surrounding the follicle there is marked engorgement of the vessels and even punctate hemorrhages and collections of leucocytes.

In interstitial oöphoritis the inflammation begins in the stroma, but soon extends to the ovisacs. It may exhibit every shade of intensity, from intense hyperæmia to complete necrosis (*putrescentia ovarii*). In the less severe forms the ovary is enlarged (to twice its normal size), is soft, and of a reddish or even dusky hue, but there is no attending peri-oöphoritis. On section the appearances are identical with those described under hyperæmia, but the moist, œdematous condition of the cut surfaces is more marked ; the ovisacs are unaltered. Microscopically, we note vascular engorgement, extravasation, and infiltration of the stromal interspaces with leucocytes. In the stroma itself

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[1] *Archiv für Gynäkologie*, Bd. iii., 1872, p. 183.

the spindle cells are increased in number, but appear smaller than normal and irregular in their distribution, while the connective-tissue cells are enlarged as well as more numerous. As the inflammation becomes more severe the ovary is not only more swollen (sometimes to three or four times its usual dimensions), but lymph is deposited on its exterior in consequence of the accompanying peritonitis. On section, minute yellow points and lines may be observed throughout the stroma, especially in the neighborhood of the hilum, from which they seem to radiate, while numerous punctate hemorrhages are appreciable to the naked eye (*oöphoritis hæmorrhagica*). The follicles show the cloudy and granular degeneration before described. Under the microscope the stroma is seen to be crowded with leucocytes, which occupy the interstices between the fibro-muscular bundles and form small abscesses. Hemorrhagic foci are more or less frequent. The subsequent advance of the inflammation may result in the formation of one or more abscesses of considerable size, or in transformation of the entire ovary into a pulpy mass, which on section presents the ordinary appearances of gangrene, all trace of the original structure being lost. The latter condition is seen in bad cases of puerperal septicæmia, especially where the organ is buried in exudation and its vascular supply is cut off.

Although we are unable, for lack of opportunities, to study the different steps of the process anatomically and to state positively the exact mode of resolution in acute inflammation of the ovary, we can infer from the final condition what the intermediate steps must have been. As before stated, the lesser degrees of acute oöphoritis are undoubtedly more common than is usually taught; at least we must assume this from an examination of ovaries usually described as being the seat of chronic disease and a comparison of the results of clinical and anatomical facts. In slight follicular inflammation the follicular wall may be thickened, as well as the surrounding stroma, so that, being unable to discharge its contents, the ovisac develops into a cyst, as will be described later; or the fluid may be absorbed and the follicle may contract and finally disappear, leaving a scar or depression to mark its site. The cicatrix resulting from the destruction of such a central ovisac may closely resemble a corpus fibrosum; indeed, Slavjansky applies this term to it, although Patenko used it originally in connection with a non-inflammatory degenerative process in the follicle. If there were many of the fibrous bodies the entire ovary might be cirrhotic. The slight adhesions which accompany follicular oöphoritis may be sufficient to imprison the ovary, but they seldom interfere with its vascular supply or impair its functions.

In mild interstitial oöphoritis (the non-septic form) resolution may be complete, as in other organs, but after changes have taken place in the cells of the stroma there is the usual hyperplasia which attends

inflammation of fibro-muscular tissue, the ovary being permanently enlarged. This sequela is rare; cirrhosis, from contraction of the new-formed connective tissue, is more frequent. Localized thickenings in the stroma result from scattered foci of inflammation; the stroma between them may be histologically normal.

Abscess-formation in the ovary is comparatively infrequent, but not so rare as has been stated. There may be one or several abscesses, and they are usually found only in one ovary. A true abscess-cavity with a pyogenic membrane is rarely found, except in cases of long standing; if superficial, the wall of the sac is thickened externally by the adhesions in which the ovary is buried. Histologically, ovarian abscess does not present any special peculiarities. Its contents consist of pus, mixed with blood (from secondary hemorrhages), broken fibrous tissue, sloughy material, and granular débris. The origin of such an abscess from an extravasation is purely hypothetical.

Symptoms.—It is only exceptionally that acute inflammation of the ovary presents symptoms which are not merged with those of localized peritonitis. Even where no peritonitis is present, as in the follicular form accompanying certain blood diseases, the trouble remains latent or is masked by the serious general disturbance. Perhaps the most typical case would be one in which prolonged hyperæmia of the ovary resulted in actual inflammation, the symptoms referable to the former condition becoming aggravated and having added to them subsequently evidences of localized peritonitis. The symptoms of abscess-formation in the ovary are rather more definite, since after the subsidence of the peritonitis (especially if the latter has been of gonorrhœal origin) there remain local tenderness, fever, and sometimes a tumor. The differential diagnosis between this condition and pyosalpinx or pelvic abscess proper is extremely difficult, and will be considered subsequently.

The fact that the pain is limited to one side would point to the ovary as the seat of trouble. In a well-marked case of acute oöphoritis, due, for instance, to sudden suppression of the menses, the patient complains of severe shooting pains in the ovarian region, increased on deep pressure. According to the neurotic character of the subject, she may or may not have various reflex disturbances, especially mammary and vesical. Frequent and painful micturition is noted, while the passage of feces through the rectum (especially if the ovary is displaced so as to lie in contact with it) is attended with great pain. The knee is drawn up on the affected side, and tension of the abdominal muscles results whenever an attempt at palpation of the affected side is made. If the pain can be differentiated from that caused by peritonitis, it may be described as more localized and of a peculiarly boring character. The occurrence of nausea in cases where the peritonitis was not

general would point to trouble in the ovary, which is well known to give rise to this symptom. An examination of chronically diseased ovaries removed by laparotomy will make it evident that recurrent attacks of acute inflammation undoubtedly occur in such organs where the symptoms are masked by those referable to tubal disease and resulting peri-oöphoritis. The development of a localized abscess with discharge of its contents into the rectum, bladder, and less often into the vagina, after disappearance of the symptoms of peritonitis, would point to probable suppuration in the ovary. The sympathy between the ovaries and the parotid glands has been noted by several observers; cases have occurred in which oöphoritis alternated with parotitis. This phenomenon might furnish a clue in obscure cases.

DIAGNOSIS.—As will appear from the foregoing, the subjective symptoms of acute oöphoritis are rarely sufficiently clear to permit a positive diagnosis. The pain is not pathognomonic, although, as distinguished from that due to peritonitis, it is more of a neuralgic character, and is apt to be accompanied by referred pains in the corresponding thigh, the mamma, etc. If strictly unilateral and localized in the ovarian region, it becomes a more valuable indication. If the patient is known to have had similar attacks at the time of the menstrual period (gonorrhœa and sepsis being rigidly excluded), a diagnosis of acute ovarian trouble is justifiable, although peri-oöphoritis may none the less account for the symptoms. Physical examination of the patient unless she is under ether is practically useless, since, even if tympanites is moderate, the abdominal muscles are kept so rigid that bimanual palpation is out of the question. Hence the importance of administering an anæsthetic, especially if operative interference is contemplated.

Now that surgeons do not hesitate to open the abdomen in case of need, even in acute peritonitis, the propriety of using every means to arrive at a fairly accurate diagnosis is evident. If the attendant has examined the patient before the attack, he will be able to judge whether there has been any change in the size or consistence of the ovary which is supposed to be the seat of trouble; more important still, he can exclude suppuration in a pre-existing cyst (dermoid or cystoma), which might readily be mistaken for ovarian abscess if its presence in the pelvis was not previously known.

Cases of puerperal oöphoritis have been reported in which the enlarged, tender ovaries were clearly mapped out at the sides of the enlarged uterus. If a globular, well-defined mass, fixed or movable, is felt at the side of the uterus, but separated from it by a distinct interval, it is probably the affected ovary. The almost invariable presence of peri-oöphoritis, which not only surrounds and fixes the diseased gland, but commonly fuses it and the corresponding tube into a shapeless mass, renders an exact diagnosis extremely difficult if not impossible.

The recognition of ovarian abscess is not so difficult. It depends upon the development of a tumor in the ovarian region, preceded by the symptoms of acute ovarian and peri-ovarian trouble previously described. The acute symptoms may subside, but repeated chills, fever of a remittent type, gradual decline of the health—in short, the usual evidences of a suppurative process within the pelvis—indicate that the disease has assumed another form. Examination shows that the mass previously assumed to be an inflamed ovary has increased in size, and is perhaps as large as an orange, while fluctuation can be detected more or less clearly according to the locality of the tumor.

The differential diagnosis lies between suppuration of the ovary, suppurating cystoma or dermoid cyst, enlargement of the tube, and parametric abscess. The history of the case will afford a clue to the true condition. Even if a cyst was not known to exist before the occurrence of the acute symptoms, suppuration would hardly take place in it so rapidly, and the tumor would not be so acutely sensitive as the inflamed ovary. Tubal enlargement is more chronic in its occurrence, the symptoms are less acute, and the tumor is more elongated in shape, lies nearer to the uterus, and is usually less clearly defined, on account of the dense adhesions which surround it. Pyosalpinx is attended with recurrent attacks of peritonitis which often leave the tumor no larger than before; abscess of the ovary, on the contrary, tends to a rapid development and a termination by rupture. On palpation, pyosalpinx (hydrosalpinx is not often attended with symptoms of acute inflammation) gives more of a doughy sensation, a suppurating ovary being tense and fluctuating.

Small pelvic abscesses may closely resemble those located in the ovary. But the former are fixed, while a suppurating ovary may be movable, are less circumscribed, and bear a closer relation to the vaginal vault, which generally presents that peculiar hard, rigid condition with which the gynecologist is so familiar. In a doubtful case the cautious use of a fine aspirating needle is justifiable; that is to say, when the tumor is easily accessible through the fornix. The writer observed a case of unsuspected extra-uterine pregnancy (that had probably existed for years), with inflammation and suppuration of the sac following an attack of pelvic peritonitis, in which the symptoms closely simulated those of ovarian abscess. The small mass at the side of the uterus had always been regarded as a prolapsed ovary.

The subsequent history of a case of supposed acute oöphoritis may furnish proof of the correctness of the original diagnosis. In other words, if a woman after recovering from an attack such as has been described is left with one or both ovaries enlarged and sensitive, or perhaps small and cirrhotic (as proved by subsequent menstrual disturbances), it may be fairly assumed that she had inflammation in the

organs themselves as well as in the peritoneum surrounding them, and that this inflammation has resulted in the condition known as chronic oöphoritis.

PROGNOSIS.—In puerperal cases the involvement of the ovaries does not influence the already grave prognosis. Primary acute oöphoritis, even when it ends in suppuration, is by no means necessarily fatal, although the presence of doubt as to the point at which the abscess may rupture always renders the outlook a serious one. If the trouble is localized in the ovary and the adjacent peritoneum, it may entirely subside, although the results unfortunately remain. While pelvic exudations may in time become more or less completely absorbed, so that the imprisoned organs again attain nearly their normal range of mobility, an ovary once the seat of acute inflammation is never restored to full functional usefulness. The only sign of the former inflammation may be cortical induration or a localized thickening of the stroma, but the delicate gland has had its usefulness permanently impaired. Even if the patient is not rendered liable to a recurrence of the original trouble, the acute often passes over into a subacute oöphoritis which terminates in general cirrhosis. Complete " resolution," such as occurs in other organs, probably never takes place in the ovary. Consequently, though we may not take a gloomy view of acute oöphoritis as regards actual danger to life, we cannot promise the patient a " cure," but must rather predict more or less constant ovarian trouble. If both ovaries are affected, she will probably be sterile, not alone because of the extensive intrinsic changes, but by reason of the accompanying peri-oöphoritis. If the inflammation is secondary to specific salpingitis, the outlook is still less promising.

Abscess of the ovary does not by any means invariably rupture. Every laparotomist has removed specimens which had doubtless been safely buried in adhesions for months. Absorption or caseation occurs here as elsewhere, provided the patient's vital powers do not succumb to the drain. Unfortunately, these abscesses rupture into the peritoneal cavity with a frequency which is in striking contrast to the history of ordinary pelvic abscesses. This is probably due to the fact that the former are not immediately adjacent to the rectum and vagina, as are the latter. Ovarian abscesses rupture most frequently into the large intestine in the neighborhood of the sigmoid flexure, and usually close promptly after complete evacuation of their contents. If the pus has been long retained and the walls of the abscess-cavity are thick, a permanent fistula may remain. Sometimes the abdominal wall is perforated.

TREATMENT.—The medicinal treatment is the same as that recommended in peritonitis—*i. e.* applying ice-bags or the cold-water coil to the abdomen in the earlier stage of the inflammation, and hot poultices

later. Some practitioners apply leeches over the seat of pain. Blisters should certainly be rejected, as increasing the patient's sufferings without accomplishing any definite results. Opium is now used sparingly, if at all, by those who have much experience with acute peritonitis; it is much better to rely on early and frequent depletion of the intestinal tract by salines, aided, if need be, by turpentine enemata. If the temperature is high, antipyretics (antifebrin or antipyrin) should be given, while the ice-cap will be grateful to the patient. Generous diet and stimulants, as indicated by the pulse, are most important; signs of abscess-formation should be constantly sought for. The usual teaching is to aspirate the abscess through the vaginal roof if possible, and afterward to establish a free opening and wash out the sac with antiseptic solutions. It is evident that unless the abscess is on the point of rupturing externally, search for pus in the tumor is attended with more or less danger to the surrounding parts.

While the treatment of these cases must depend largely upon the experience and boldness of the surgeon, the tendency of modern gynecologists, even such a conservative teacher as Winckel, is to follow the example of Tait, who says: "In the event of the attack appearing to threaten the life of any patient under my care, I would not hesitate to open the abdomen, cleanse out the cavity, and possibly remove the diseased organs. When an ovarian tumor is gangrenous or suppurating, we serve the patient by promptly removing it; and I do not see why this principle should not be extended. The result of the disease is nearly always to destroy the functions of the glands, and therefore in prospect of a fatal issue of the disease the argument against an operation, that it will unsex the patient, need not be considered."

Chronic Oöphoritis.

The expression "chronic oöphoritis" is more or less misleading, since it conveys the impression of an active inflammatory process, whereas it is more often intended to apply to an anatomical change in the ovary resulting from previous inflammation. But this confusion of terms is peculiar to pelvic pathology, as in the use of the word "peri-oöphoritis" to describe at once localized peritonitis and the resulting adhesions around the ovary. "Salpingitis" is applied quite as loosely both to acute inflammation of the mucous membrane lining the tube and to the hypertrophy of its wall resulting from such inflammation. More properly, such inflammatory processes in the ovary as are not of an acute character are really subacute. The reader will find it simpler to regard the change in the organ considered in this section as an "end-process," which, however, is not necessarily permanent, since it may be modified by subsequent attacks of acute inflammation. In the

same ovary we may find side by side evidences of acute inflammation and of atrophy or cirrhotic change due to former active disease; in other words, an ovary may be subject to several fresh attacks or exacerbations of acute inflammation before it becomes entirely transformed into a mass of firm fibrous tissue.

To compare the process again with that of localized peritonitis, each recurring attack of peri-oöphoritis leaves the adhesions more dense and firm than before. Just as salpingitis may result in several different forms of tubal enlargement—which are named, according to the character of the contents of the tube, hæmato-, hydro-, or pyosalpinx, or from the thickening of the wall "pachysalpingitis," interstitial salpingitis, hypertrophy, etc.—so the ovary as the result of acute or subacute inflammation may present several forms. It may be smaller than normal (cirrhosis), or may be considerably enlarged, so as to fairly deserve the name tumor. This enlargement may be at the expense of the fibrous stroma, of the Graafian vesicles, or of both. Separate names have been applied to these conditions according to the prominent feature of the enlargement (stromal or follicular), but these distinctions are more or less artificial, the process being essentially the same in every specimen, although the macroscopic results are different.

ETIOLOGY.—There is considerable difference of opinion as to the frequency with which acute oöphoritis terminates in the chronic form. The impossibility of obtaining exact data is due to the fact that the former affection is so often latent or masked by other conditions that the diagnosis is uncertain. That chronic oöphoritis is relatively frequent is evident from the fact that it has been noted in nearly five per cent. of all pelvic troubles. It is essentially an affection arising during the period of greatest sexual activity (twenty to thirty), and is to be referred primarily to frequent or prolonged pelvic hyperæmia, usually the active form. Hence it is commonly noted as a result of violent and oft-repeated intercourse, or of ungratified sexual excitement in single women or in the ill-mated. Increase of the normal menstrual congestion (suppression from cold) is doubtless a frequent etiological factor. Fibrous hyperplasia may follow repeated pregnancies for the same reason.

Chronic oöphoritis of secondary origin is more common than the primary form. Extension of the inflammation through the tubes, peri-oöphoritis, and resulting disease of the ovaries is a sequence often observed. Not that the chronic inflammatory process in the ovary partakes of the specific character of the salpingitis. Whether the latter is septic or specific, the localized peritonitis resulting is the same, and consequently the affection of the ovaries. The *modus operandi* is sufficiently evident. Not only is the circulation in the ovarian vessels impeded by the surrounding adhesions, thereby inducing in the

organ a condition of passive hyperæmia, but the tunica albuginea is so thickened that the ovisacs are prevented from rupturing, and either degenerate and disappear or form cysts. If the salpingitis and peri-oöphoritis are of an acute character, acute oöphoritis may occur, which in its turn results in cirrhosis or hyperplasia.

Disease of the ovary is a frequent accompaniment of all enlargements or displacements of the uterus by which the pelvic circulation is disturbed or obstructed. Hence the common enlargement of the glands in cases of subinvolution, retroversion, uterine fibroid, etc. In unilateral ovarian cyst the opposite ovary not infrequently shows evidences of disease, probably due to its increased functional activity. Prolapse of the ovary is at once a cause and an effect of chronic enlargement of the organ. It will be considered under a separate section. The usual reasons assigned for the more frequent enlargement of the left ovary are the pressure of fecal matter in the adjacent rectum and sigmoid flexure, and the fact that the left ovarian vein empties directly into the renal vein (instead of into the vena cava, as on the right side), there being no valves at the point of entrance. Both anatomical conditions directly favor venous obstruction in the ovarian plexus.

Thus far, we have referred to general disease of the ovary, whereby the normal gland is transformed into a mass of dense fibrous tissue, with or without accompanying cystic degeneration of the follicles. Evidences of localized inflammatory trouble are extremely common, and are explained in various ways. Small hemorrhages may result in the destruction of individual ovisacs or the formation of minute indurations in the midst of the stroma. These indurations (not true cicatrices) are situated most often at or near the periphery of the ovary, where their presence is explained by reference to slight peritonitic adhesions at opposite points on the surface of the organ. Localized thickenings of the cortex lead in time to cystic degeneration, as will be explained subsequently.

Individual ovisacs may become diseased from unknown causes, and after reaching the surface may either atrophy or rupture prematurely, leaving small indurations to mark their site; or the follicular membrane may be so thickened that rupture is impossible, the follicle enlarging to form a cyst perhaps as large as a walnut, while the rest of the ovary still remains functionally active. We know as yet comparatively nothing concerning the etiology of localized abnormalities of the ovary. It is not certain that we are justified in regarding them as inflammatory in their character. They may represent simply degenerative processes, such as are very common in the organ. The important practical point is that the presence of chronic oöphoritis must be inferred from the *tout ensemble* of the ovary, and not from one or

several localized indurations, which may not, after all, be pathological. The same may be applied to deductions based upon the presence of a few dropsical follicles in a gland otherwise fairly normal in appearance.

GROSS ANATOMY.—In describing the diseased ovary we shall consider the three different results of chronic inflammation—cirrhosis, fibrous hyperplasia, and follicular or cystic degeneration. While specimens are sometimes observed presenting examples of pure cirrhosis or hyperplasia, cystic degeneration is of course always accompanied by one or both of the other conditions; in fact, it is common to meet with all of these processes in the same ovary, which is only another evidence of the fact before stated, that in no case is an abnormal process within the gland confined strictly to either the stroma or the ovisacs.

Chronic interstitial oöphoritis has been compared to cirrhosis of the liver. Thus, Noeggerath (following Virchow) has described two stages —one in which the ovary is rather soft, smooth, and considerably larger than normal (comparable to the so-called hypertrophic period of cirrhosis), and a second stage, in which the gland becomes small, hard, and nodular, like a "hob-nail" liver. This view is an attractive one, but, unfortunately, the subject of ovarian pathology is still too obscure to allow us to state positively that certain anatomical appearances represent an early stage of chronic disease, and that certain other appearances belong to a more advanced one. As well say that we know why two ovaries placed under apparently the same conditions should be so essentially different in structure. Whether we accept the theory of progressive change from hypertrophy to cirrhosis, or assume that each form represents a distinct "end-result" of chronic oöphoritis, for practical purposes we may still consider three types of ovary—the atrophic, hyperplastic, and cystic.

FIG. 295.
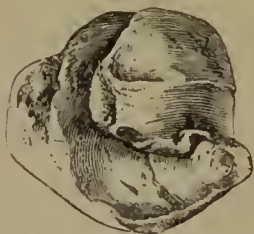
Cirrhosis of the Ovary with Pyo-salpinx (natural size).

FIG. 296.

Atrophy of the Ovary with Pyosalpinx (natural size).

A cirrhotic ovary resembles closely in size, shape, and appearance the normal gland that has undergone senile atrophy; indeed, cirrhosis is premature atrophy. But a careful inspection of the former will reveal evidences of pathological changes, while the greater thickening

of the tunica albuginea and the presence of peri-oöphoritis, which commonly attends cirrhosis, prove that it is not a physiological condition. A typical cirrhotic ovary is below the normal size, is hard and almost cartilaginous in consistence, and of an irregular, nodular shape. The senile gland, while it may also be nodular, still preserves the general shape of the healthy organ, the irregularities on its surface being due to the pits and cicatrices marking the sites of former Graafian vesicles. In this connection it should be stated that there are numerous variations as regards both shape and size : an ovary buried in a mass of dense adhesions may shrink to the size of a bean, while as a result of long-continued pressure it may assume a fusiform shape or may be completely flattened. The grayish or pinkish-gray color of the healthy ovary is changed to a general grayish-white or pearly hue, sometimes relieved by reddish spots which indicate local hyperæmia.

When studied more in detail, it will appear that the firm consistence of the ovary is due to the increase in thickness of its cortical portion ; this thickening is referable partly to the organized lymph that has been deposited upon the outer surface, but more to intrinsic changes. The adhesions from former peritonitis may be represented by slender threads easily separated from the ovary, or by dense cicatricial tissue, in which it is so firmly imbedded that in tearing away the organ fibrous bands adhere to it. The irregularities on the surface of the diseased gland are of different sizes, since they represent the cicatrices remaining after the rupture (or more frequently degeneration without rupture) of dropsical ovisacs, which could not discharge their contents properly because of the thickening of the tunica albuginea. Small papillary masses, like sessile subperitoneal fibroids, may be seen projecting from the surface ; these are merely localized thickenings of the albuginea, and are partly the result of cicatricial contraction of the surrounding tissue. In a specimen showing general cirrhosis all traces of cysts have disappeared, but in many cases where the atrophic change has not involved the entire gland a few Graafian vesicles or their remains may be observed. On section the abnormal thickness of the tunica albuginea will at once attract attention ; it may be several millimeters. The thickening is seldom uniform, an increase at one or more points being due either to greater induration of the stroma or to the presence of an external layer of organized lymph.

The cut surface of a cirrhotic ovary usually presents a uniform fibrous appearance, like a section of a fibroma. Unless there is localized hyperæmia, its color is whitish rather than pinkish (as in the normal ovary), the paucity of blood-vessels being apparent to the naked eye. Dropsical follicles may be imbedded in the midst of the stroma ; less often they lie near the periphery beneath the thickened tunica.

Specimens of considerable enlargement of the ovary due to pure

fibrous hyperplasia are not common.   Most of the supposed examples
of this form of hypertrophy will be found to be mixed types, cystic

FIG. 297.

FIG. 298.

Cut Surfaces of a Cirrhotic Ovary (natural size).

Fibroid Hypertrophy of the Ovary (natural size).

degeneration predominating.   There is considerable difference of opin-
ion among writers as to the identity of fibrous hyperplasia and true
fibroma of the ovary, some holding that the latter (especially if of
moderate size) is not a neoplasm at all, but simply a proliferation of
the stroma resulting from some previous inflammatory process.   Thus
Olshausen[1] says of ovarian fibromata : "They can never be isolated,
like fibro-myomata of the uterus, from the mother structure, but are
hyperplasiæ of the stroma, diffuse connective-tissue neoplasms, which
are partly the result of acute or chronic inflammatory processes."
Patenko[2] thinks that a fibroid arises by the enlargement and coales-
cence of several corpora fibrosa, the latter developing from corpora
lutea and sometimes from degenerated follicles.   The origin of large
fibromata from the ovary is, he thinks, "more than doubtful."
While there is sometimes great difficulty in deciding this point in
the case of small tumors—in fact, where the entire ovary is affected
it is impossible—Virchow's description of these growths shows how
readily they may be mistaken for the inflammatory enlargement.
"The portion of the ovary which is not involved in the forma-
tion of the tumor," he says, "very often presents the changes of
chronic oöphoritis in all its forms.   Not only is the stroma gen-
erally indurated, but the albuginea is thickened and sclerotic, and
the follicles are converted into corpora fibrosa."   The form of hyper-
trophy referred to here is that of general, uniform enlargement of the
ovary to dimensions two or three times that of normal, the gland still

[1] *Krankheiten der Ovarien*, last ed.

[2] "Ueber die Entwicklung der Corpora Fibrosa in Ovarien," *Virch. Arch.*, Bd.
lxxxiv.   For literature, see also Coe: " Fibromata and Cysto-fibromata of the Ovary,"
Am. Journ. Obstet., Oct. and Nov., 1881, and "A Case of Fibro-cyst of the Ovary,"
ibid., July, 1882.

preserving to a considerable extent its normal shape and relations, while on section peripheral ovisacs or their remains are visible. As before stated, some observers are disposed to regard this form of enlargement as an initial stage of cirrhosis—a point which it must be extremely difficult to prove to one's own satisfaction, since, clinically, enlarged, hard ovaries may remain *in statu quo* for years unless they are finally removed by abdominal section, apparently not larger than when they were first detected.

From the fact that cirrhotic ovaries are commonly buried in dense adhesions, while those that have undergone fibrous hyperplasia are more often free from imprisoning bands of lymph, as well as from the absence of positive evidence, either clinical or anatomical, of any transition stage, we are warranted in inferring that it is not safe to reason by analogy in the case of such a complex organ as the ovary. Instead of constructing a theory to harmonize the different forms of ovarian disease, it seems simply to infer that chronic oöphoritis sometimes results in atrophy (especially where the circulation is interrupted by peri-ovarian adhesions), and sometimes in hypertrophy, the difference in the two forms being determined by the diminution or increase of the blood-supply. Cystic degeneration, being an expression of hypernutrition, would naturally be more frequently associated with the latter variety.

A typical hyperplastic ovary is usually free from adhesions, prolapsing simply from its weight, and only contracting adhesions in case of secondary peritonitis. In genuine cases of fibrous hypertrophy the tube is not usually the seat of disease ; in fact, the ovaries which are so commonly found fused together with diseased tubes are rarely of the pure fibrous type. The affected gland is ordinarily as large as a walnut ; it may be oval, more often is globular in shape, has a smooth exterior (sometimes slightly nodular), and a peculiar hardness which is readily appreciable on vaginal examination ; even by the touch the difference between such an ovary and one enlarged by reason of cystic degeneration is quite apparent. The surface may or may not bear evidences of former ovisacs. In short, the tumor resembles closely a small pedunculated fibroma of the uterus. This analogy is borne out on section of the ovary, which cuts with that peculiar sensation characteristic of fibrous growths. The cut surface may present no resemblance whatever to that of the normal gland—only firm, dense connective tissue, interlacing in all directions as in pure fibroma. There is no evidence of hyperæmia or subacute inflammation. The tunica albuginea may be distinguishable from the deeper portion of the stroma, but sometimes there is no distinct line of demarkation. Cysts, if present, are usually few in number and are situated just beneath the tunica (see Fig. 298). Their walls are much thickened. They are readily

distinguished from the irregular cavities or "geodes" in commencing cystic degeneration of ovarian fibroids.

In describing a "cystic" ovary we must exclude, on the one hand, one that varies in appearance from the normal only by reason of the presence of a few enlarged peripheral vesicles, and on the other a small ovarian cyst. A consideration of the mode of origin of the latter belongs elsewhere, but it may be positively affirmed that cystic ovaries rarely develop into large cystomata by the dropsical distension and coalescence of adjacent ovisacs. Although Olshausen[1] adds confusion to this obscure subject by including simple *hydrops folliculi* in the same chapter with cystomata, he expressly states that the development of the latter from the former is rare. Cystic ovaries belong to the mixed type —*i. e.* the anatomical changes in them are not confined to the ovisacs, but involve the stroma as well; in fact, the latter stand in a direct causal relation to the former. It is safe to say that the boundary between the normal and the pathological is often extremely ill defined. According to a recent writer,[2] "there is no morbid condition which can be termed 'slight cystic degeneration.' Moderate enlargement of a few Graafian vesicles is not enough to constitute it, since this occurs in the fœtal ovary as a physiological process."[3] An apparent increase in the number of visible ovisacs is no evidence of an actual increase in the entire number as the result of disease; Virchow showed the absurdity of this idea forty years ago. Hydrops folliculi, on the contrary, as Sinéty and Melassez assert, results from destruction of the ovisac, and is associated with stromal disease. Nagel adopts this view, and believes with these writers that a dropsical vesicle "can never develop into a true cyst;" the corpus luteum is much more likely to form a cyst than is the Graafian body. It is evident that, from an anatomical standpoint, the diagnosis of "cystic degeneration" cannot properly be made except after a careful macroscopical and microscopical examination of the suspected ovary, but practically it is important for the surgeon to have some criterion by which to judge concerning the functional integrity of such a suspected organ.

Enlargement of the gland is a necessary result of this condition. The presence of half a dozen vesicles on the exterior of an ovary of normal size and consistence, with no other evidences of disease, certainly does not justify the use of the term "cystic" and the consequent extirpation of the gland. A typical specimen is enlarged to two or even three times its normal size, is more globular than usual, and of softer consistence. If there is a large central cyst, a distinct sense of fluctuation may be obtained on compressing the specimen between the thumb and finger. One or more cysts of considerable size projecting

[1] *Op. cit.*   [2] Nagel: *Archiv für Gynäkologie,* Bd. iii. Hft. 3.
[3] Klebs: *Handbuch der Path. Anatomie,* p. 789.

above the surface of the organ may give to it an irregular knobbed appearance. As a rule, the enlargement is at the expense of a few cysts, one or two of which may reach the size of a marble or English walnut. Sometimes the ovary is divided into two distinct portions, one consisting of a single unilocular cyst, the other of the cirrhotic stroma from which all traces of ovisacs have disappeared. The cyst may continue to grow at the expense of the stromal remains, until the latter become indistinguishable and there exists an actual ovarian cyst having its origin in dropsy of a single peripheral follicle. Again, the dropsical ovisac may be imprisoned in the depths of the stroma in consequence of indurative changes in the latter, and may undergo gradual enlargement, the stroma being atrophied from pressure until only the cortical portion remains, forming the wall of a unilocular cyst; it is evident that the size of such a central cyst must be limited by reason of its environment, so that it can hardly exceed that of an English walnut, and would never be regarded as a tumor.

Fig. 299.

Moderate Cystic Enlargement of the Peripheral Follicles (Leopold).

Examining a cystic ovary in detail, we note evidences of chronic oöphoritis in the shape of localized thickening of the albuginea (which may be due to peri-oöphoritis), especially in the immediate vicinity of the dilated ovisacs; if the tissue covering a cyst is thickened, further enlargement of the latter cannot occur toward the periphery, so that it may project only slightly above the surface, although it is of considerable size. Not more than one-third of a cyst usually projects, so that it is really larger than it appears on inspection. The cysts vary in color according to the character of their contents and the thickness of their walls. If the latter is thin and transparent and the fluid is serous, they appear of a light-gray or yellowish-color; hemorrhage into a cyst or retrograde changes in its wall give the fluid a brownish tinge or render

it white and turbid. If the wall over the projecting portion of the
cyst becomes much thinned, it presents the same appearance as a nor-
mal ovisac when on the point of rupturing, a fine network of vessels
being seen; indeed, normal and dropsical follicles may be present side
by side, and may rupture at or near the same time, the cyst simply col-
lapsing and forming a large cicatrix, while a corpus luteum forms in
the ovisac and undergoes the usual changes. Such small, thin-walled
cysts are seldom an accompaniment or result of chronic oöphoritis, but,
as Olshausen[1] observes, " the stroma of the ovary is intact, and the
majority of the follicles are in a normal condition."

In direct contrast to these minor degrees of cystic dilatation is the
rare condition in which the majority of the ovisacs undergo marked
enlargement, so encroaching upon the stroma that it disappears entirely,
adjacent cysts being separated from one another by thin septa of con-
nective tissue. The individual cysts seldom exceed a pigeon's egg in
size, but the ovary may be as large as the fœtal head at term. Both
ovaries are affected. Comparing these ovarian tumors with specimens
of moderate cystic degeneration, we must agree with Olshausen that
" these are merely differences of degree, and do not support Tait's view
that the tumors form a special variety." " It is a question, however,"
adds the same writer, " whether these cases should not be included
among the proliferating cystomata, or whether they do not represent a
transition to the latter." The study of these tumors is interesting from
its bearing upon the mode of development of true unilocular ovarian
cysts, but it does not concern us here.

A careful inspection of the cut surface of a cystic ovary (the section
being made in the plane of its longest diameter) will furnish a clear
idea not only of the nature and distribution of the cysts, but of their
mode of origin. When the interior of the ovary is exposed, numbers
of deeper cysts will be seen, the presence of which was not suspected.
These are scattered about in the stroma, each one being surrounded by
a ring of indurated tissue, while at the same time its proper wall is
distinctly thickened. This is most marked in the case of the periph-
eral cysts, which are covered by the thickened albuginea; in fact, the
presence of this general cortical thickening is an important factor in
their etiology, as will appear later. As before mentioned, the ovary
may be transformed into a single large central cyst surrounded by a
narrow ring of stroma; like nearly all the others, such cysts contain a
clear serous fluid and are lined by a smooth, glistening membrane.

The stroma of a cystic ovary shows the hyperplastic and cirrhotic
changes already described, but these are usually localized; in some
places it may present a normal appearance or it may be the seat
of hyperæmia. Hemorrhage into pre-existing cysts is not common,

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[1] *Op. cit.*

though the latter may originate from follicular apoplexy. Colloid patches are most frequent in the immediate neighborhood of the deeper cysts. The question naturally suggests itself: Given two ovaries which macroscopically appear to be nearly identical, why do the Graafian vesicles show a general tendency to enlargement in one and not in the other? We are not in a position to affirm what is the true cause of the dropsy; there may be disease of the affected ovisac, but Peaslee's theory, that it is the result of a catarrhal process, is too simple to explain it satisfactorily. Moreover, it would not account for the simultaneous enlargement of so many vesicles, the different degrees of dilatation, and the fact that the peripheral ovisacs are most often affected. In simple cystic dilatation, unaccompanied by disease of the stroma, Olshausen suggests that recurring menstrual congestions, while they cause an increase in the amount of liquor folliculi, may not be sufficiently acute to produce rupture; hence the gradual dilatation of the vesicle (which in these cases is of course situated at the periphery) until it ruptures in consequence of increased pressure. In direct contrast with this mode of origin is that in which follicular apoplexy results from excessive congestion, as described in the section on Hyperæmia. True cystic disease is clearly a result of stromal changes referable to chronic oöphoritis which not only induce a state of hyperæmia, that causes a progressive dilatation of the vesicle as above described, but also prevent the cyst from rupturing. The failure of the deeper cysts to reach the surface and discharge their contents or to rupture *in situ* is to be ascribed not only to the thickening of their walls, but, above all, to the induration of the surrounding stroma. Where the entire stroma is transformed into firm fibrous tissue the cyst cannot enlarge, and often atrophies and disappears; hence the comparative absence of cysts in large fibroid ovaries.

Fibrous hyperplasia must be localized in order to be associated with extensive cystic degeneration. Cysts situated beneath the albuginea, which has been thickened in consequence of chronic inflammation (whether in the ovary or in the surrounding peritoneum, or in both), are prevented from rupturing for a similar reason, although their walls being more elastic they are usually able to dilate more than those situated in the midst of the indurated stroma.

From what has been said, it is clear that so-called "cystic degeneration" is not a distinct variety of ovarian disease, but is merely a result of the changes already described as due to chronic oöphoritis. Follicular dropsy, cirrhosis, and hyperplasia are commonly met with in the same specimen; in one the interstitial changes may be most marked, in another the follicular. The ovary is designated according to the predominating character of the anatomical change, but, while general cirrhosis or fibrous hyperplasia may be unaccompanied by marked follic-

ular changes, true cystic degeneration does not exist without evidences of at least localized disease of the stroma.

Minute Anatomy.—A microscopical examination of sections of an apparently normal ovary frequently reveals unsuspected morbid conditions which, though localized, show that the integrity of the gland has been impaired. But it by no means follows that these changes are all due to inflammatory processes. Degeneration and atrophy of the ovisaes and localized induration of the stroma occur in specimens which can hardly be regarded as actually pathological in character. The fact that experienced observers not only see different objects in similar sections, but interpret identical appearances differently, shows the intrinsic difficulties of the study of ovarian pathology. That the subject has not been exhausted must be inferred from the descriptions of newly-discovered morbid processes which appear from time to time. It is not desirable in a practical article to enter into a discussion of the disputed points in the pathological histology of the ovary, since these possess little interest for the general reader. The subject of incipient cyst-formation alone would furnish material for a monograph. In describing the microscopical appearances seen in a specimen of chronic oöphoritis we shall have particular reference to the cystic type, since this is most frequently met with and combines in one or a few sections a number of morbid processes. The subject will be simplified by studying first the follicular, and then the stromal, changes.

FIG. 300.
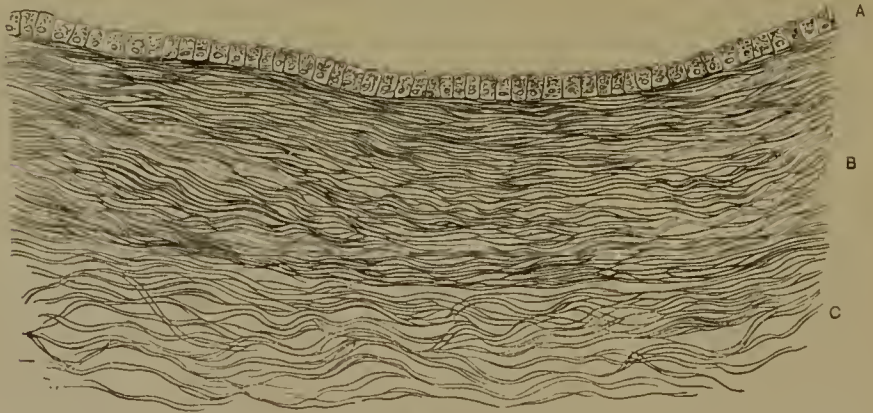
Section of the Wall of a Simple Cyst (Olshausen : A, epithelial lining; B, inner fibrous layer; C, outer fibrous layer.

A section of a simple cyst, such as has been described, shows that its wall is composed of two fairly distinct layers of fibrous tissue ; on the inner rests a single layer of cylindrical epithelium. A ring of indurated stroma surrounding the cyst forms a third layer ; if the cyst is peripheral, it will be covered by the albuginea, in which case (especially if the latter has been thickened in consequence of peri-oöphoritis) the

wall will not be of uniform thickness. Fatty degeneration and disintegration of the lining epithelium may be observed. It should not be forgotten that these same changes (degeneration of the epithelium and sclerosis of the cyst-wall) are seen in the ovaries of children without evidences of an inflammatory origin.[1] The vascular supply of the cyst is comparatively poor ; the general course of the mural vessels is toward a point opposite the inner end of the ovary. In consequence of localized hyperæmia of the stroma surrounding the cyst its own vessels may be dilated. The contents of the cyst is a serous fluid of low specific gravity, containing sodium chloride and a trace of albumen. The larger cysts contain a few epithelial cells and blood-corpuscles, if hemorrhage has occurred, occasionally a little pigment and cholesterin ; in the fluid from the smaller dropsical follicles (even those as large as a marble) will be found cells of the membrana granulosa and the ovum, the latter being granular and indistinct and wanting its germinal vesicle. Whether the cells of the membrana granulosa become transformed as the cyst grows larger, or not, is a disputed point ; the fate of the ovum when the cyst reaches the size of a walnut is also uncertain.

It is of importance to study the retrograde changes in dilated follicles, since these have been held responsible for the development of true cystomata. We have seen that a superficial cyst may rupture and its walls may simply collapse and atrophy, leaving a small depression or cicatrix, but that central cysts surrounded by indurated stroma cannot discharge their contents in this way. It is probable that some of the latter atrophy in consequence of contraction of the cirrhotic stroma ; at least that is the impression given by a microscopical examination of the small pits or cavities in the interior of fibroid ovaries ; the fluid may be absorbed and the walls may be brought in contact by continued pressure. Moreover, the vascular supply of the cyst may be cut off by compression of the vessels, as well as in conse-quence of changes in the vessel-walls. The so-called *corpora fibrosa* described by Patenko[2] as sharply-

Fig. 302.

Fig. 301.

Fig. 301.—Longitudinal Section of an Ovary, showing corpora fibrosa (Patenko): *a*, large corpus fibrosum ; *b, b*, smaller ones.
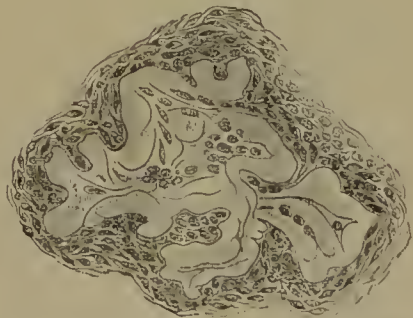
Fig. 302.—Section of a Small Corpus Fibrosum in a medium-sized follicle, showing sclerosis confined to the membrana propria (Patenko).

[1] Slavjansky ; *Virchow's Archiv*, Bd. li. p. 470.
[2] *Virchow's Archiv*, Bd. lxxxiv. p. 193.

defined masses of firm fibrous tissue entirely distinct from the surrounding stroma may result from the granular and colloid metamorphosis of dropsical, as well as of undilated, follicles. As the follicle degenerates its thickened wall shrinks and forms folds, which are penetrated by ingrowths from the stroma. The walls of the blood-vessels surrounding the affected follicles undergo indurative changes which involve both the media and the adventitia, while the stroma is infiltrated with leucocytes, showing that the process is to some extent of an inflammatory character. Corpora fibrosa when once formed do not grow any larger, but adjacent ones may coalesce, so that, if the follicles are generally affected, the entire ovary may be transformed into a fibrous tumor as large as a hen's egg. This condition may closely resemble that already described as fibrous hyperplasia, but the latter is due to stromal, the former to follicular, changes.

It must not be forgotten that in a cystic ovary we may meet with involution and atrophy of follicles which have never exceeded their normal size; disease of the stroma will usually be noted in their immediate vicinity, although the change in the follicles does not appear to be of inflammatory origin. We cannot discuss the relation of these degenerative processes to cyst-formation. Harris and Doran[1] have suggested that cysts may be formed by "a process of abnormal involution of Graafian follicles, in which there is an active ingrowth from the surrounding stroma and a long persistence of certain remains of the membrana propria"—a view to which Gabbett[2] takes exception. Various writers—more recently Coblenz[3]—have described hyaline or colloid degeneration of the follicles.

From a minute examination of the follicles in an ovary which is the seat of chronic disease, it is clear that the morbid processes are mainly degenerative, rather than inflammatory, and are directly due to changes in the stroma. The latter are often quite complex; different sections of the same ovary may present an entirely different appearance. In one spot the tissue may be firm, non-vascular, almost cicatricial, while in another it is soft, œdematous, and hyperæmic; in one section the stroma may present a fairly normal appearance, while in another it is entirely transformed into firm connective tissue. True cicatricial tissue, as Ziegler[4] has shown, is seldom found in the ovary. In the neighborhood of the dropsical follicles the cirrhotic change is usually quite marked, but in the albuginea it is especially prominent. In that part of the stroma which has not undergone fibrous hyperplasia or atrophy the blood-vessels are often generally dilated, and there may be punctate hemorrhages and collections of blood-pigment;

[1] *Journal of Anatomy and Physiology*, 1880, 50, p. 453. [2] *Ibid.*, 1881, 16, p. 192.
[3] Abstract of article in *London Med. Record*, 1882, p. 81.
[4] *Path. Anatomie*, 1885, p. 1483.

interstitial groups of leucocytes are sometimes observed, marking the presence of subacute inflammation. A condition recently described by Gottschalk[1] under the term "cavernous degeneration" of the ovary, in which the stroma presented a general angiomatous appearance, was doubtless one of general ectasis of the vessels in consequence of chronic disease.

Colloid transformation of the stroma has attracted considerable attention in view of its possible relation to cyst-formation. The con-

FIG. 303.
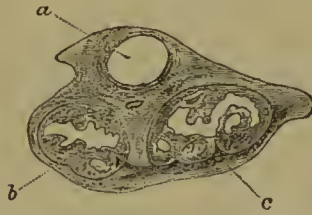
Section of Ovary, showing mucoid masses (Doran): *a,* normal follicle; *b, c,* follicles which have undergone abnormal involution, containing gelatinous material (magnified by pocket-lens).

dition is similar to the "geodes" in fibrous tumors, and suggests a like origin (from lymphangiectasis). Irregular cavities, without distinct cellular lining, exist in the midst of the stroma, filled with a translucent hyaline material; ingrowths or trabeculæ from the stroma cross the cavities, as well as blood-vessels, which may rupture and give rise to hemorrhage. They are often associated with hyperæmia and follicular hemorrhages, but there is no evidence, according to Gabbett,

FIG. 304.
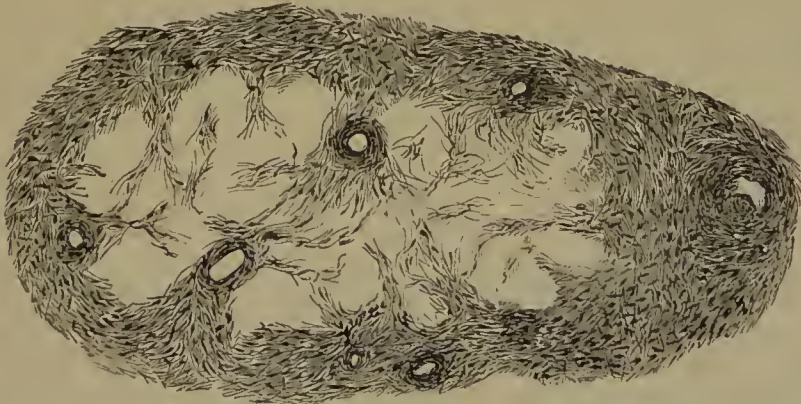
Section of a Degenerated Follicle, containing myxomatous material (Doran), showing ingrowths of the stroma (two-inch objective).

that they are of inflammatory origin. These spaces grow by union with each other, and the stroma around them becomes indurated so as to form a sort of wall, but there is no evidence that they ever develop

[1] *Archiv für Gynäkologie,* Bd. xxxii. Heft 2.

into cystomata. As the blood-vessels in the vicinity of the colloid spots show marked diminution of their lumina, it is suggested that this may be simply another form of degeneration consequent upon imperfect nutrition of the diseased ovary.

The vascular changes in connection with chronic oöphoritis are not without interest. In the less diseased portions of the stroma the arteries may be dilated and tortuous, but in the region of the fibrous hyperplasia the inner and middle coats may be so much hypertrophied that the lumen is nearly obliterated. The middle coat is much thickened by a deposit of material which resembles amyloid. Noeggerath has suggested the possible origin of some ovarian cysts from such diseased vessels. As Gabbett[1] aptly concludes: "The question of the origin of cysts is one of such consequence in ovarian pathology that there is a natural tendency to assign to all morbid appearance an importance as being somehow connected with cyst-development." Allusion has already been made to the direct relation between a diminished blood-supply and the various degenerative changes observed under the microscope. The diseased condition of the intra-ovarian vessels explains this in part; doubtless the obstruction to the circulation outside of the ovary caused by the pressure of peritoneal adhesions is sometimes a potent factor.

TUBERCULOUS OÖPHORITIS.

Tuberculosis of the ovaries is usually treated in chapters on solid tumors, but there seems to be no reason to describe tubercle as a neoplasm, since when it occurs in the tube it is regarded as a form of specific inflammation.

Tuberculosis of the ovary is certainly rare, especially the gray miliary nodules; the latter develop in cases of general tuberculosis, being a local expression of the general infection. Klebs states that it is never associated with tuberculous inflammation of the uterine and tubal mucosa; which is clearly an error, since in 56 cases of tuberculosis of the pelvic organs collected by Mosler and Talamon the ovaries were found to be the seat of tubercle in 12. It is natural to infer that the infection might be transmitted directly through the tubes as well as through the medium of the blood.

A tuberculous ovary is usually somewhat enlarged, is of soft consistence, and on section presents cheesy foci varying in size from a millet-seed to a marble. By the softening of such nodules collections of semi-fluid material result, which might escape into the cavity through rupture of the sac, causing fatal peritonitis. Peri-oöphoritis is a usual accompaniment of this condition.

The diagnosis of ovarian tuberculosis is more a matter of scientific

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[1] *Loc. cit.*

than of practical interest. As the development of the disease is always secondary to general tuberculosis, its presence may be inferred in cases of this character in which progressive enlargement of the ovaries can be detected. The diagnosis of tuberculous salpingitis, however, is much more probable under these circumstances, as the tubes are so much more frequently affected.

Laparotomy will of course not be undertaken with the express purpose of removing affected ovaries and tubes in cases of general tuberculosis. The question of operative interference in tuberculous oöphoritis and in tuberculous salpingitis is somewhat different, since in the latter case the disease may originate in the tubes and may be confined to them, thus furnishing the ordinary surgical argument for extirpation—the possible avoidance of general infection. Winckel does not believe "that salpingotomy for tubal tuberculosis has a very promising future."

PROLAPSE OF THE OVARY.

The displacements of the ovary considered in this connection are at once the cause and the result of disease. A previously healthy organ when carried downward with a retroverted uterus has its circulation more or less obstructed, and becomes the seat of the chronic changes already described ; this is especially likely to occur if it is buried in adhesions. On the other hand, an ovary enlarged in consequence of fibroid hyperplasia or cystic degeneration tends, other conditions being favorable, to sink below its normal plane.

ETIOLOGY.—Descent of the ovary independent of the uterus may be due purely to increase in the weight of the gland. This has been proved beyond doubt by cases in which temporary prolapse has followed the moderate enlargement attending menstruation or attacks of acute inflammation, the ovary returning to its normal position after it has regained its former size.

Prolonged hyperæmia from sexual irritation is regarded by Goodell as a common cause of enlargement and descent : for the same reason chronic oöphoritis is a direct causal factor. Certain conditions favor this displacement ; thus, during pregnancy, through the elongation of the ovarian ligaments, the ovaries are carried far above their usual level, while at the same time they become considerably enlarged. If for any reason involution is retarded, the heavy glands, being less restrained in their movements (in consequence also of the relaxation of the broad ligaments during pregnancy), tend to sink downward.

Acute prolapse of the healthy ovary from blows or falls probably does not occur, or if it does it is extremely rare ; in cases in which this accident has been supposed to take place there was doubtless really a

recurrence of a former displacement. Increased abdominal pressure alone could hardly cause prolapse of the normal ovary, unaccompanied by displacement of the uterus. Pressure from an over-distended bladder or morbid growth may displace an ovary downward, but this is not a true descensus. Perimetric adhesions in the broad ligaments may draw the organ from its proper position, but it is a question how far actual prolapse is due to traction alone. In every case in which a displaced ovary is found buried in adhesions there is doubt as to whether the displacement preceded or followed the peri-oöphoritis. The history of the patient and the results of previous examinations must settle this point.

In general, we may infer that the inflammatory process was secondary. The frequent association of acquired anteflexion and prolapse of one or both ovaries is an interesting fact that has never been satisfactorily explained. It is difficult to see how the uterine displacement can be a direct cause, and the posterior parametritis that produces the anteflexion is seldom sufficiently extensive to draw the ovary into Douglas' pouch.

ANATOMY.—In descensus of the ovary alone the organ (usually the left) sinks downward and backward, and at the same time describes an arc toward the median line, of which the Fallopian tube and ovarian ligament form the chord; the effect of this movement is to bring the ovary behind the uterus, unless the latter remains in its normal position (Barnes). The left ovary is most frequently displaced, as it is more liable to enlargement from disease for the reasons already mentioned.

FIG. 305.
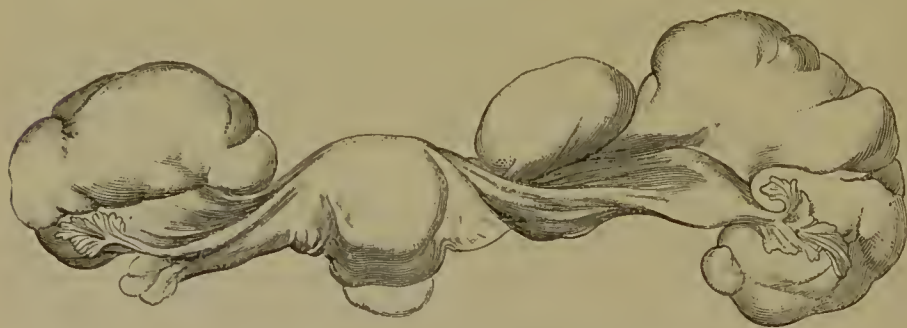
Prolapse of the Ovaries with Fixation (Olshausen).

The ovary in its downward descent reaches the portion of the posterior pelvic fossa just above the level of the sacro-uterine ligaments known as the "retro-ovarian shelf," where it may remain. As this space on the left side is encroached upon by the rectum, the corresponding ovary tends to slip downward still farther into the cul-de-sac of Douglas; hence the explanation of the well-known clinical fact that when both

ovaries are prolapsed the left lies at a lower level and is more accessible
to the examining finger. For this reason it may appear to be more
enlarged than the right, when the reverse is really the case. As has
been said, it may usually be inferred that when an enlarged ovary is
found at the bottom of Douglas' pouch it is the seat of chronic oöpho-
ritis, which existed before the displacement took place, and is aggra-
vated by the abnormal position of the organ and the interruption to
its circulation, especially at the time of menstruation. If it is freely
movable and is not extensively diseased, it may be confidently ex-
pected that it will diminish in size and weight if it can be elevated
to such a level that the strain will be taken from its vessels and its
supporting ligaments recover their tone. It is evident that even a
perfectly healthy ovary when lying in the posterior cul-de-sac is placed
under the most favorable conditions (congestion, mechanical injury,
etc.) for the development of subacute inflammation, which in its turn
is attended with peri-oöphoritis and consequent fixing of the gland in
its abnormal position. Thus the morbid change in the ovary is retro-
active, as it were, giving rise to conditions which in themselves increase
the original trouble.

The association of tubal disease with the ovarian displacement has
not been considered, as this subject belongs under another head ; the
combination is a very common one, and the accompanying peritonitic
exudation is much more extensive than when the ovary alone is affected.
When the latter is completely buried in adhesions, as is usually the
condition in cases of pyosalpinx, it is not only liable to attacks of
acute inflammation, but often becomes completely atrophied, so that it
is difficult to discover it even at the post-mortem examination.

The mode of descent and the ultimate position of the ovaries in
cases of retro-displacement of the uterus do not especially concern us,
except that here it is important to note that the prolapse of the ovaries,
being due to mechanical traction, usually precedes chronic oöphoritis ;
however, in cases of subinvolution of the uterus the ovaries share in the
general pelvic congestion and become enlarged and heavier. Since the
uterus is the first to sink downward, the ovaries in descending execute
a movement nearly the reverse of that before described, so as to lie
somewhat in front of the former. When fixed by adhesions, however,
they are more often found just external to, or even beneath, the fundus
of the retroflexed uterus ; they are then subject to the same morbid
influences as were described before.

SYMPTOMS.—In order to avoid repetition the reader is referred to
the section on the symptomatology of chronic oöphoritis. Prolapse
of the ovary, not being a disease in itself, can hardly be said to give
rise to any separate set of symptoms. Such as arise are explicable on
purely mechanical grounds, and are such as would be expected from the

anatomical relations of the displaced ovary. Thus, the passage of
hardened feces through the rectum is accompanied by darting pains in
the adjacent ovary, which may persist for some time after the act,
accompanied by nausea and sometimes various reflex pains in distant
parts of the body. Vesical and rectal tenesmus, sexual excitement,
and other phenomena may be present. Dyspareunia is a common
symptom, coitus giving rise to paroxysms of pain, though less severe
than those attending defecation. Locomotion is attended with pains in
the groin and sacrum extending down the thigh. Dysmenorrhœa is of
course marked. In short, the symptoms are such as belong to chronic
disease of the ovary, *plus* those arising from its abnormal and exposed
position.

DIAGNOSIS.—This is readily made according to the ordinary rules
of gynecological examination, provided the ovary is completely pro-
lapsed, and especially if it is enlarged. On the other hand, if it
is small and occupies the retro-ovarian shelf, instead of the bot-
tom of Douglas' pouch, and the vagina is unusually long, the most
experienced examiner, although he may suspect the presence of the
displaced ovary from the peculiar pain described by the patient when
firm pressure is made against the posterior fornix, cannot map it out
satisfactorily. Much may be learned by touching the patient when in
the left lateral position; the perineum can then be pushed upward by
the knuckle, so that the tip of the index finger can reach and explore
the deepest fornix.

While the question of differential diagnosis is treated elsewhere,
brief mention should be made of a few small tumors in this region
which may be mistaken for prolapsed ovaries. The fundus uteri can
hardly be confounded with an ovary by any one who uses ordinary
care; the passage of the probe ought to settle the diagnosis. A small
pedunculated subperitoneal fibroid is hard, painless, and moves with the
uterus when that organ is not fixed. Indurations in the peri-uterine
tissues, the result of former inflammatory processes, are less circum-
scribed in shape than ovaries, are not so sensitive, and the pain pro-
duced by firm pressure upon them is rather of a dull aching character
than sharp and sickening. Such indurations are most commonly situ-
ated at the bases of the broad ligaments; prolapsed ovaries are seldom
found exactly in the lateral pouches.

Isolated masses of hardened fecal matter are sometimes mistaken for
small displaced ovaries—an error which is avoided by noting the loca-
tion, mobility, softness, and comparative insensitiveness of scybala.

Enlargements of the tube are often mistaken for those of the ovary;
when both tube and ovary are diseased and are fused together by exu-
dation, refinements in diagnosis become practically impossible and one
must be guided by the previous history of the case. Under favorable

circumstances it is possible to tell by the vaginal touch whether cystic degeneration or fibrous hyperplasia is the existing condition in the displaced gland, but more often the examiner can only say that it is larger than normal. Laparotomists constantly find that the sensation of size conveyed by the touch is deceptive. Prolapsed ovaries are, as a rule, larger than they appear to be, since only a small portion of their surface is accessible to the finger-tip.

The question of the mobility of a prolapsed ovary is one of no small importance to the patient. This is determined by making firm pressure upon the organ and noting whether it can be lifted above the level at which it is apparently fixed; the reader must not mistake elevation of the pelvic contents *en masse* for actual lifting of the ovary.

Peri-oöphoritis explains the extreme pain and tenderness which are present in cases of fixation of the ovary. The increased pain at the time of menstruation is not necessarily indicative of recurrent attacks of localized peritonitis; the ovary, surrounded and compressed by dense adhesions, is unable to enlarge, as it does normally from the increased afflux of blood, and the ovisacs cannot burst through the thickened cortex. With regard to the inclusion of nerves, whether extra- or intra-ovarian, within the indurated or cicatricial tissue, we are entirely in the dark.

PROGNOSIS.—If the displacement of the ovaries depends upon retroversion of the uterus, by replacing the latter organ and keeping it in position by means of a suitable pessary they may usually be lifted out of harm's way. But if they are fixed, while the uterus is movable, by restoring the latter to a position of anteversion so much traction is exerted upon the imprisoned glands that the pain thus occasioned may be worse than before. In cases of primary displacement of the ovaries the prognosis is good as regards relief of the distressing symptoms, so long as they are freely movable and show no evidences of extensive disease. Whether there will ever be a perfect cure, in the sense that the organs can be permanently retained at or near their normal level in the pelvis, is doubtful. It will depend upon whether or not they diminish in weight and their ligaments recover their lost tone.

The prognosis in a case in which the ovary is fixed by perimetric adhesions, is very tender to the touch, and is the site of the pains above described (both at and between the menstrual periods) should be extremely guarded. Two questions are involved—the cure of ovarian disease and the cure of the displacement. The latter depends upon purely mechanical principles. While there are cases in the practice of every gynecologist in which persistent treatment with resolvents and tampons has apparently caused the softening or disappearance of peri-oöphoritic adhesions, accompanied by diminution in the size and tenderness of the affected ovary and the restoration of some degree of

mobility, palliative treatment often proves to be unavailing and surgical interference offers the only positive means of relief.

TREATMENT.—The treatment of chronic oöphoritis has been described elsewhere, so that we shall consider here more especially the treatment of the displacement. A diseased and prolapsed ovary, as well as the peri-oöphoritis associated with it, is most favorably situated for local treatment, while at the same time we are able to recognize and eliminate certain harmful influences, as we cannot do if the organ has not descended. It must be confessed that the non-surgical treatment of this condition is at present far from being satisfactory, but we can at least promise the patient relief from her most distressing symptoms, even if we cannot conscientiously promise a cure.

Certain hygienic measures naturally suggest themselves in all cases. Disturbances of a mechanical character should be excluded. Since defecation causes not only extreme pain, but actual injury to the tender and inflamed ovary, the bowels should be carefully regulated, so that the evacuations may be semi-fluid. This does not mean that the patient should at one time have a diarrhœa and at another a discharge of small scybala (which latter cause more irritation than a copious evacuation of formed feces), but that the large intestine should be thoroughly emptied at the outset by means of large enemata of soapsuds and ox-gall, and afterward kept empty. By administering daily mild laxatives, such as cascara, salines, or aperient waters, this result can be obtained ; but if the patient relies entirely on enemata, assisted by occasional doses of some vigorous purgative, the rectum will continue to be filled with scybala in spite of the daily evacuations. Unless the attendant takes the trouble to assure himself that the bowels are properly moved, he will find that his most carefully-conducted local treatment yields unaccountably poor results.

Dyspareunia, a symptom rarely absent in these cases, at once suggests a source of irritation which may undo all the results of treatment. The difficulty of properly regulating, not to speak of absolutely interdicting, sexual intercourse is almost insurmountable, especially in women of the lower classes. The gratifying results observed in the case of women with ovarian trouble from the higher walks of life, after a stay of a few months in a private hospital, are due quite as much to the suspension of their marital relations as to the local treatment which they have received ; this may appear to be a strong statement, but it is borne out by the facts. In the case of the average dispensary patient the pelvic organs probably rarely enjoy physiological rest, except when she is in a hospital or otherwise necessarily isolated. It is perhaps the wisest plan to secure the co-operation of the patient's husband, and to explain to him the necessity of exercising due restraint. If the performance of the sexual act is attended with severe local and reflex pains and general

nervous disturbances, and local tenderness persists for some time afterward, he must be told plainly that no improvement can be expected unless he refrains entirely.

Rest in the recumbent posture during the day should be insisted on, especially at the time of the menstrual period. Unfortunately, such rest is not obtainable in the case of patients who are obliged to work in stores, factories, etc. But women who are engaged in housework can nearly always recline for an hour in the afternoon, and still longer during menstruation, or at least during the first day or two.

The hot vaginal douche is of course a valuable analgesic in this condition, whether it acts by modifying the entire pelvic circulation or by exercising a direct vaso-constrictor action upon the extra- and intra-ovarian vessels. Certainly, no one at the present day is prepared to dispute the practical results, as regards the relief of local pain and tenderness, when this agent is properly employed; but, as Dr. Emmet has so often said, injections of hot water are seldom administered in a manner to do the slightest good, simply from the neglect of a few simple details. There is no class of cases in which the benefit from this agent is more apparent than in those now under consideration. However, it can only be thoroughly tested in hospitals; there its effects are unquestioned. It should be stated that every patient with a tender prolapsed ovary cannot endure copious hot injections, but may be made worse by them; they are not to be ordered indiscriminately, but should be used carefully at first, and their results should be watched.

In considering the more direct treatment of prolapse of the ovary we naturally divide all cases into two classes, between which there is a wide difference as regards treatment, as well as prognosis. A prolapsed ovary may be either movable or fixed; if movable, the indication is to raise it up out of harm's way and to support it by a suitable instrument; if fixed, to loosen its adhesions and eventually to elevate it as before, or, this failing, to render the patient's lot as endurable as possible. The other alternative in the latter condition is surgical interference, to which the gynecologist may resort sooner or later according to his tendencies and experience.

In a simple case of recent retroflexion of the uterus, with accompanying dislocation of the ovaries, by replacing the former organ the ovaries are often carried so far upward that a lever pessary may be introduced and worn with perfect comfort. The tissues may so far regain their tone that the organs do not descend again after its removal, or at least not so low as before. In many cases, however, the pessary, if it is long enough and has a sufficiently large cross-bar to distend the posterior fornix and keep the uterus in position, presses directly upon the ovaries, and causes so much pain that it must soon be removed. If only one ovary is enlarged and tender, this may some-

times be avoided by making a depression in the upper end of the instrument opposite to the affected gland. When the ovaries alone are displaced, a pessary is used for the sole purpose of elevating them, which can only be done by exerting direct pressure on them. Bulb-pessaries may accomplish this, and may be tolerated for a time, but in order to prevent the ovaries from slipping down behind the bulb the latter must

Fig. 306.
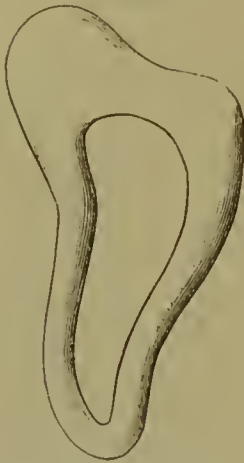
Mundé's Pessary for Prolapsed Ovary.

extend up so high as to make intolerable pressure on the rectum or the sacral nerves. Various substitutes for the bulb have been devised: the cross-bar is padded with cotton or it is constructed of soft rubber, but, while the firm surface presented by the hard-rubber bulb is thus avoided, the pessary is rendered so soft and yielding that its actual supporting power is greatly diminished and the ovaries are not sufficiently elevated. More recently bulb-pessaries of wire covered with soft rubber have been used with advantage in these cases. They usually afford only temporary benefit for the reasons given; added to this is the disadvantage that they must be removed at frequent intervals because of their tendency to cause an irritating vaginal discharge. It is only in exceptional cases that a patient can endure for a month or two the pressure of such a pessary upon a prolapsed ovary; still, by alternating between the use of the instrument and the vaginal tampon she may be made quite comfortable, if not permanently cured.

Among other expedients for temporarily replacing the dislocated ovaries should be mentioned Campbell's method, in which the patient assumes the exaggerated knee-chest position, so that gravity and pneumatic pressure through the vagina shall cause the uterus and its appendages to fall forward. The habitual practice of this manœuvre, followed by a period of prolonged rest on the side, naturally tends to relieve the strain on the relaxed ligaments and to relieve congestion. A firm vaginal tampon may be advantageously applied while the patient is in the knee-chest position, since in this way the retention of the ovaries at the highest possible point is assured. Further reference to the use of the tampon in this connection is unnecessary. It is enough to say that it is a valuable temporary support, and if it can be used daily or every other day the patient is not only much relieved, but in time the ovaries may become less sensitive, so that they will tolerate a pessary. Unfortunately, even when they are easily replaceable, they are so sensitive that they will not endure the presence of a cotton tampon sufficiently

large and firm to raise them considerably above their usual abnormal position.

With regard to the operative treatment of non-adherent dislocated ovaries we must be governed by the patient's wishes, as well as by the results of a careful and sufficiently extended course of palliative treatment. The indications for removal of the organs will be discussed elsewhere. Whether pain alone is sufficient to justify it is a question that every operator must settle for himself. There are undoubtedly some cases in which it seems to offer the only prospect of relief from this pain. Winckel echoes the sentiments of the more conservative gynæcologists when he says, "The ovary should be extirpated only when it is diseased." This rule is undoubtedly a sound one, but it is not easy to follow it in these cases, because we cannot always determine clinically to what extent a prolapsed ovary is the seat of organic disease. Moreover, it may be questioned if such an ovary is ever perfectly healthy; the fact that it is prolapsed and tender presupposes conditions under which it could not long retain its functional integrity.

If the surgeon shrinks from extirpating a displaced ovary, he may resort to a less radical procedure—oöphorraphy. This ingenious (but not very practical operation) consists in shortening the relaxed infundibulo-pelvic ligament by "taking a reef" in it and stitching it to the hilum of the ovary, with the idea of keeping the latter in its normal position. But the causes that led to the displacement are still present, and there is little hope that the ovary will remain in place, especially if it has been so long prolapsed that it has undergone marked organic changes. It seems most applicable to cases of acute or recent prolapse, in which, however, there is always a good prospect of relief from palliative measures.

Operations which permanently correct retroflexion of the uterus (shortening of the round ligaments, hysterorrhaphy) of course afford more or less relief to patients whose ovaries are also prolapsed, since the glands rise up in the pelvis as the uterus is elevated, and may not sink downward again. Hysterorrhaphy offers the additional advantage that the ovaries can be removed at the time of the operation if it is judged expedient. On the other hand, cases are on record in which, after the performance of the Alexander-Adams operation, it became necessary to perform oöphorectomy because the ovarian trouble associated with the uterine displacement was not relieved.

The mechanical treatment of prolapse with fixation of the ovary demands an infinite amount of patience on the part of both physician and patient. The latter should be told plainly at the beginning that any improvement in her condition will be slow, and may not be observed by herself until months have elapsed, and that an act of imprudence on her part may undo the results of weeks of treatment. The

object of the latter is twofold—to relieve the actual inflammation in and around the displaced organ, and to dislodge it, if possible, from its abnormal position. To the former description of the treatment of chronic oöphoritis and peri-oöphoritis we have nothing to add here, except to say that the hygienic measures, hot douches, etc., before mentioned are especially applicable to the cases under consideration, as well as the usual applications (iodine, glycerin, and boroglyceride tampons) to the posterior fornix. Graduated pressure by means of cotton tampons is the agent upon which the gynecologist most relies in order to relieve the congestion of the ovary and to cause gradual absorption of the surrounding adhesions. Whether the tampon elevates the ovary alone or the entire pelvic contents, it is certain that it relieves pain and after its persistent use the organ apparently becomes more movable. The proper use of the tampon in this connection requires more judgment than is supposed by those who have never taken the trouble to distinguish between its various functions. Many patients can only bear one or two tampons at first, but subsequently they tolerate from six to eight, packed in firmly. It is unnecessary to enter into the details of this little operation.

Pelvic massage is useful where the ovary is less sensitive and there is no history of recurrent attacks of inflammation. As applied to these cases it consists in making steady upward pressure upon the gland with the tip of the index, or index and middle fingers, for one or two minutes, varied by occasional gentle rubbing or kneading movements, while the other hand makes counter-pressure upon the abdomen and draws the uterus forward. This manœuvre should be executed very carefully, and should be suspended as soon as it causes undue pain, or if it is followed by an increase in the local tenderness.

Electricity offers a valuable means of relieving pain. Galvanism is preferable; it should be applied two or three times a week for ten or fifteen minutes at a time, a current of from fifteen to twenty milliampères being sufficient. Its use requires no special knowledge. A large flat sponge, or a copper plate covered with a wet cloth, placed over the ovarian region is connected with the negative pole, while a ball electrode is introduced into the posterior fornix and is held in contact with the prolapsed ovary. The patient ought not to experience actual pain, but simply a warm, burning sensation. The séance should be omitted two or three days before and after the menstrual period. (See also Vol. I., article on " Electricity in Gynecology.")

It may be that after such treatment has been conscientiously carried out for several months, or even years(?), the ovaries, although less tender than before, are still fixed at the bottom of Douglas' pouch. All evidences of subacute inflammation having ceased, and the presence of dangerous tubal disease being excluded, we may venture to attempt

forcible reposition by Schultze's method, which consists in etherizing the patient, placing her in the lithotomy position, and introducing the fore finger of one hand into the rectum, while the other hand grasps the fundus uteri above the symphysis and draws it forward. The rectal finger in contact with the imprisoned ovary seeks for an interspace between the gland and the surrounding adhesions, into which it is grad- nally bored until the latter become detached; the pressure is always made against the adhesions, not upon the ovary itself. The patient must be carefully guarded against subsequent peritonitis. Tampons or a pessary should be introduced to elevate the organ after it has been freed. This method is especially applicable to cases in which the uterus is also retroflexed and adherent. Statistics regarding the ultimate results of this operation are too few to allow of a judgment of its merits. It is evident that a recurrence of the displacement and a re- formation of the adhesions are almost inevitable unless the patient can wear a pessary constantly, which is doubtful.

Among the palliative operations practised for the relief of this condi- tion is laparotomy and subsequent ventro-fixation of the uterus—whether by hysterorrhaphy, shortening of the round ligaments, or retention of the uterus in a position of anteversion by means of a drainage-tube introduced to the bottom of Douglas' pouch. These operations, or rather modifications of the same operation, are alike in their essential details; the abdomen is opened, the uterus and its appendages are freed from their adhesions, and the former is permanently retained in its nor- mal position, in the hope that not only it, but the tubes and ovaries also, will remain in their new plane. With regard to the accomplishment of the latter there is considerable doubt. Although they may not sink as low as before in the pelvis, it is highly probable that the ovaries will again become prolapsed and will contract new adhesions. Most opera- tors will prefer to remove organs that have long been the seat of pain, and which in the majority of cases show evidences of advanced disease. When, as often happens, the tubes are also diseased, there is no doubt as to the proper course to pursue.

From what has been said it may be inferred that there is only one view to take of imprisonment of the displaced ovary—the pessimistic one. On the contrary, there are many of these cases in which pallia- tive treatment has afforded so much relief that an operation, formerly proposed, is no longer to be thought of. It cannot be said that such patients are cured, since the affected organ remains *in situ.* But it is smaller and less tender than it was originally, dysmenorrhœa is less severe, and the patient with the exercise of constant care leads a fairly active and comfortable life, instead of being a half-invalid. This is not a cure, but it is infinitely better than her former condition, so that she is satisfied to try no additional experiments of a surgical character.

DISEASES OF THE FALLOPIAN TUBES.

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I. NEOPLASMS OF THE TUBES.

By HENRY C. COE, A. M., M. D.

"The structure of the uterine and tubal walls being similar," says Winckel, "all tumors which affect the uterus may be found in the tubes, affections of the uterine glands being excepted." "Neoplasms of the tubes," he adds, "are usually secondary, primary affections of this kind being extremely rare." Bearing in mind these elementary facts, it is evident that morbid growths as encountered in this locality present no special peculiarities, and that it is unnecessary for us to enter deeply into the question of their histogenesis.

Neoplasms of the tubes seldom reach a large size as compared with those of the uterus; moreover, it is sometimes difficult to decide whether a given enlargement is a true neoplasm or is simply the result of hypertrophy following inflammation, as in the case of chronic hyperplastic oöphoritis. This will appear in connection with so-called papilloma of the tube.

I. Benignant Growths.

a. Fibroma.—True fibromata are rare, and should be carefully distinguished from localized thickenings in the wall of the tube which result from inflammatory processes. The former originate from the fibro-muscular layer, and are usually intramural, less often subperitoneal, while the latter, as Hennig[1] pointed out, are essentially cicatrices situated in the submucous layer. Fibromata in the tubal wall seldom exceed a pea in size, although Simpson[2] is reported to have found one as large as a child's head. Klob[3] describes sessile and

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[1] *Op. cit.*, p. 73. [2] *Diseases of Women*, p. 541.
[3] *Path. Anat. der Weibl. Sexualorgane*, p. 292.

pedunculated fibrous bodies on the external surface of the tube. Histologically, they are identical with fibromata of the uterus, sometimes containing smooth muscle-fibres.

b. Lipoma.—Fatty tumors are extremely rare, and have not been observed larger than a walnut. Rokitansky[1] found one situated on the lower border of the tube just beneath the peritoneum.

c. Papilloma, Mucous Polypus.—It is doubtful if these ever occur as true neoplasms, similar to those in the endometrium; at least, those specimens which have been carefully examined have shown well-marked evidences of their origin by simple hypertrophy of the mucous membrane, the result of salpingitis.

d. Cysts.—From this category is of course excluded cystic enlargement of the tube itself (partial or general hydrosalpinx) and tuboovarian cyst. The bodies referred to are small vesicles, rarely larger than a hazelnut, and usually situated beneath—or, more properly, within—the peritoneal covering of the tube, where they present an appearance identical with that of the little cysts so often observed between the folds of the mesosalpinx. Hennig describes the hydatid of Morgagni under this head.

It is difficult to avoid the conclusion that many of the small vesicles frequently found in the mucous lining of the ampulla have a similar origin to the papillomata already referred to, since the absence of glands in this region forbids our regarding them as retention-cysts (like the Nabothian follicles, for example); in fact, Hennig speaks of the sago-like bodies found in the wall of dilated tubes. These cysts are sometimes pedunculated, and contain a clear serous fluid yielding mucin; under the microscope it shows degenerated epithelial cells, occasionally ciliated. Kiwisch mentions a form of cyst situated in the submucosa which, from his description, suggests the "geodes" found in uterine fibroids undergoing cystic degeneration—irregular spaces surrounded by a wall of fibrous tissue undergoing fatty degeneration. Similar cavities within the muscular layer seem to originate from interstitial extravasations of blood. Faye[2] describes an atheromatous cyst which he found in the distal end of a tube. Winckel[3] calls attention to the fact that the external cysts may by their rupture give rise to localized peritonitis; this seems rather improbable, considering the small size of these bodies and the innocuous nature of their contents.

II. Malignant Growths.

Medullary carcinoma is the form of malignant disease met with in this locality, and all authorities agree that it is always secondary.

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[1] *Lehrbuch d. Path. Anat.*, vol. iii. p. 442. [2] *Norsk. Magaz.*, xv., 1861, 7, p. 593.
[3] *Op. cit.*, p. 501.

Scanzoni's[1] case of supposed primary carcinoma, if carefully studied, will hardly impress one as an exception. Kiwisch[2] affirms that he found the tube involved in upward of 24 per cent. of cases of carcinoma of the body of the uterus, while Wagner[3] notes only 5 per cent. According to my own observation, the tubes are far more likely to be secondarily involved in the malignant disease of the ovaries and peritoneum. As a rule, in cases of carcinoma of the corpus uteri the mucosa of the tubes simply shares in inflammation of the endometrium, as in ordinary cases of septic endometritis.

FIG. 307.

Carcinoma of the Tube and Ovary (Winckel).

As observed at the post-mortem table, cancerous tubes are so blended with the diseased ovaries and buried in adhesions that it is difficult to discover the original seat of the disease. The tube is usually the seat of general hypertrophy, and shows on its exterior in addition circumscribed nodules; similar nodules may be found on the mucous membrane or even imbedded in the muscular layer. In some instances the tube, like the ovary, is transformed into a cancerous mass, so that nearly all traces of its former shape disappear; the tumor may be as large as a child's head. Peri-salpingitis is an invariable accompaniment of this condition. In Dittrich's[4] case fatal peritonitis resulted from rupture of the cancerous tube.

Histologically, carcinoma of the tube presents no peculiarities requiring special mention. According to Hennig,[5] medullary cancer develops from the submucosa, as well as from the layer of tissue immediately beneath the peritoneum, and rapidly encroaches upon the intermediate fibro-muscular layer, the degeneration of which gives rise to irregular cavities.

Scirrhous cancer of the tube has been described by Rokitansky, but there is no authentic case of sarcoma on record. It is evident that the study of malignant disease in this region possesses no practical interest, since the question of surgical interference could hardly arise at that stage in the disease when the tube is involved.

[1] *Lehrbuch d. Krankh. d. Weibl. Sexualorgane,* p. 326.
[2] *Klin. Vortr.,* i. 484, and ii. 215.   [3] *Gebärmutterkrebs,* pp. 18–123.
[4] *Prager Vierteljahrschrift,* 1845, iii. p. 110.   [5] *Op. cit.,* p. 91.

Tuberculosis, being essentially an inflammatory process, is considered under the head of Salpingitis.

Sarcoma.—Saenger[1] reports a case of so-called "primary sarcoma" of the tubes, which he affirms is the only one on record. The ovaries were not affected, but metastatic deposits were found in Douglas' pouch. Considerable stress is laid by the writer upon the presence of numerous papillary projections on the mucous membrane, while the mucosa and submucosa were infiltrated with round cells, which also invaded the hypertrophied muscular coat. Both tubes were dilated and filled with a sero-sanguineous fluid. If the reader will compare this description with that of the changes produced by chronic catarrh of the tube, the resemblance will appear so striking that he must be rather incredulous as to the existence of malignant disease in this case, and especially a variety so unique in this region. The newly-formed glands described by the writer were very likely those gland-like depressions in the mucous membrane, lined with cylindrical epithelium, which are formed simply by the folding-in of the hypertrophied mucosa. Moreover, the dilated tubes were filled with a fluid such as would naturally be associated with a chronic inflammatory process. From the description of the specimen we are warranted in doubting the correctness of the diagnosis.

SYMPTOMS AND DIAGNOSIS.—In the recorded cases of neoplasms of the tube the condition was, almost without exception, discovered at the post-mortem table. This may be inferred from the fact that the tumors are usually either so small as to escape recognition in the living subject, or, being secondary to disease of the uterus or ovaries, are completely masked by the latter.

Non-malignant growths of the tube give rise to no special symptoms; in fact, as has been stated, the enlargements of the tube formerly ascribed to fibroma or papilloma are the result of chronic salpingitis.

In the rather doubtful case described by Simpson, of a fibroma of the tube as large as a child's head, there was nothing by which to distinguish the growth clinically from a solid ovarian tumor or a small pedunculated subperitoneal fibroid. From the mobility of the tube a fibrous tumor developing from it, if sufficiently large, might press upon neighboring organs, or by becoming impacted in the pelvis might give rise to the same symptoms as a uterine or ovarian tumor in the same situation, so that the question of its removal would arise.

With regard to growths of a malignant nature the case is somewhat different. Dismissing tuberculous nodules, which have been recognized by the bimanual in cases of general tuberculosis, we occasionally meet with instances in which carcinoma of the ovaries is accompanied with secondary masses in the tubes, the latter being recognized as strings of

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[1] *Centralblatt für Gynäkologie*, 37, 1886.

nodules extending outward from the uterus. But here too the pelvic organs are generally so fused together by the accompanying peritonitis that exact localization of the disease is impossible. When the corpus uteri is primarily affected by malignant disease, the tubes are more likely to become the seat of inflammatory trouble before becoming cancerous, when the symptoms would be those of salpingitis.

In general, as has been stated, neoplasms in this region possess a purely pathological interest, since when they become the seat of growths of sufficient size to be recognized (or, rather, suspected), the uterus and ovaries are already so extensively involved, and all the pelvic organs are so matted together by peritonitis, that operative interference is out of the question.

HYPERÆMIA OF THE TUBES.

The line of separation between normal and pathological congestion of the tube is so ill defined that it is impossible to state when one passes into the other. The tube has no independent blood-supply; it is simply a continuation of the uterus, and shares in inflammation of the endometrium. Moreover, since it is supplied by branches of the ovarian artery, it is directly affected by any obstruction to the pelvic circulation, whether the latter is due to local or general causes. But it is a question if the intense injection of the peritoneal covering of the tube, as well as of the mucosa, is more marked in the latter case than it is during menstruation, since, even under apparently normal conditions, the pressure in the vessels may be so great as to give rise to punctate hemorrhages. It will be evident that we never can inspect the tubes in the human subject under proper conditions for deciding this point; it is certainly not safe to rely absolutely upon the appearances observed at the operating-table, either while the organs are *in situ* or immediately after their removal. In cases in which the active hyperæmia of the menstrual nisus is added to the passive congestion resulting from venous obstruction, we obtain the best picture of hyperæmia of the tube; which condition, if prolonged even for a short period, leads to so-called catarrhal salpingitis; this hyperæmia is to be distinguished from that due to chronic changes within the tube itself or to vascular obstruction produced by peritonitic adhesions. The following is a brief description of a tube observed *in situ* in the living subject during menstruation, the active congestion being heightened by a certain amount of general venous obstruction due to the action of the anæsthetic upon the lungs: The entire oviduct was visibly increased in size, and its peritoneal covering, instead of presenting the ordinary pinkish hue, was of a purple color; the fimbriæ were swollen and injected. The mucous membrane, normally of a pinkish shade toward the abdominal end of

the tube, changing to a pale gray on approaching the uterine end, was generally swollen and presented a uniformly dark-red color. There was a slight increase of the usual amount of secretion on its surface. A short time after its removal there was nothing about the specimen to distinguish it from an ordinary normal tube, unless the mucosa in the former case was of a redder hue.

Perhaps the best examples of pure passive hyperæmia of the tubes are observed in the bodies of infants who are born asphyxiated, since the conditions are quite simple and every possible local disturbance is eliminated.

HEMORRHAGE INTO THE TUBES.

Hemorrhage into the tube may vary, as in the case of the ovary, from punctate extravasations to actual rupture of good-sized vessels, with escape of blood into the tube, and even into the peritoneal cavity. Although the hemorrhage may be either subperitoneal or interstitial, it is necessarily limited in amount in these regions, whereas when the blood escapes into the interior of a patent tube there is no limit to the quantity which may be discharged.

We would expect to find ecchymoses in or just beneath the tubal mucosa as a result of intense and prolonged active hyperæmia; it is doubtful if this ever occurs in the normal tube during menstruation, although it may follow if the menstrual congestion is added to existing inflammation. Punctate extravasations in the mucous membrane are found in subjects of all ages, and are due either to venous obstruction or to decomposition of the blood; the former are observed in cases of chronic cardiac, hepatic, or pulmonary disease, the latter in connection with infectious diseases, rarely after extensive burns or phosphorus-poisoning. These extravasates possess no importance clinically, and are rapidly absorbed, leaving microscopical collections of pigment.

If the pressure is prolonged and excessive, a vessel may rupture and blood may escape into the tube: the capacity of the latter being limited, if the abdominal end is patent the blood will ooze into the peritoneal cavity, forming an hæmatocele, the location of which will naturally be behind the broad ligament—*i. e.* retro-uterine. Fatal cases have been recorded. This accident is to be distinguished from effusion of blood due to actual rupture of the tube in hæmatosalpinx or extra-uterine pregnancy.[1] Bandl even goes so far as to state that in most cases blood escapes from the tubal mucosa during normal menstruation, and that, in consequence of the temporary dilatation of the uterine openings, this blood is able to make its way into the uterus.

[1] For further information on this subject consult the article on " Pelvic Hæmatocele and Pelvic Hæmatoma" in Vol. I.

HÆMATOSALPINX.

This signifies, in general, the retention of blood within the tube, whether the latter be patent or not; but the term has come to be used in a restricted sense, so that we now understand it to mean dilatation of an occluded tube by a considerable accumulation of blood. That the tube must be more or less impermeable in order to admit of any appreciable accumulation is evident from the fact that the effused blood rarely coagulates, but remains fluid, and would under increasing pressure tend to escape from the ostium abdominale if this were open. Bandl, in common with other writers, lays most stress upon the condition of the uterine opening, which he believes is so patulous during menstruation as to allow the blood from the tube to escape into the uterus; constriction of the tube at this point leads to the formation of a hæmatosalpinx. I have observed this condition in connection with such a narrowing of the proximal end, but it was accompanied with an obstruction of the distal extremity. It is readily conceivable that the abdominal opening of the tube was originally patent in many of these cases, so that the blood escaped into the peritoneal cavity, producing localized peritonitis which occluded the tube. It is to be noted that the distension is seldom uniform, but is confined to one or two portions of the tube, especially the distal end. This localized dilatation is readily explained, in the absence of external constricting bands, by angular flexion resulting from an exaggeration of the natural tortuosities. It will be considered more particularly in connection with Hydrosalpinx.

Hæmatosalpinx might be termed primary or secondary according as the blood is effused into a previously healthy tube or into one the walls of which are already thinned and dilated in consequence of pre-existing inflammation. Theoretically, the danger of rupture from a sudden increase of the pressure would be much greater in the latter case; practically, it would be difficult to distinguish between these conditions from the examination of a given specimen.

The source of the effusion has formed the subject of no little speculation. In a few instances the blood was apparently derived from a ruptured Graafian vesicle, the fimbriated extremity of the tube being fused with the ovary, as in cases of tubo-ovarian cyst. The frequent association of hæmatosalpinx with atresia of the utero-vaginal canal has led to the natural inference that the accumulation of blood within the tube was due to simple regurgitation from the uterine cavity. Such cases are the exception; the ostium uterinum is generally found to be obstructed, so that blood can escape neither from nor into the uterus. In Kiwisch's well-known case of hæmatosalpinx the uterus was absent. Moreover, if the distension of the tube was the result of

back-flow from the uterus, one would invariably expect to find *both* tubes dilated, whereas the dilatation is more commonly unilateral. Unquestionably, the blood is in the majority of cases derived from the tubal mucosa; in other words, it has an independent origin. The question at once suggests itself, Why is this blood effused or sweated in one case and not in another where the conditions appear to be identical? If, according to Bandl's theory before mentioned, blood is normally discharged into the uterus during menstruation, why does not retention occur more frequently in connection with other morbid conditions besides atresia? But hæmatosalpinx is relatively infrequent: Winckel observed it only four times in nearly two hundred cases of tubal affection. A review of the statistics of laparotomists shows considerable difference of opinion as to its frequency. Doubtless not a few specimens of supposed hæmatosalpinx are really early tubal pregnancies. Some dilated tubes containing a black, tarry fluid are examples of what may be termed " secondary " hæmatosalpinx ; that is to say, a small quantity of blood has been effused into a pre-existing hydro- or pyosalpinx. This is analogous to hemorrhage into an ovarian cyst. This latter fact would seldom be capable of positive proof, since, as will be seen, the changes in the contents and in the wall of the tube may follow, as well as precede, the effusion of blood.

These tumors vary greatly in size and shape ; they are usually about as large as an English walnut, but may reach the size of a large orange. The enlargement is commonly confined to the distal half of the tube; hence it tends to assume a globular rather than an elongated shape, such as is observed in hydrosalpinx profluens. Even in cases of atresia uteri the proximal end of the tube usually remains undilated. If only a moderate quantity of blood is effused, it may be absorbed before permanent dilatation of the tube occurs, or the presence of the blood may give rise to a catarrhal process which results in a gradual and progressive increase in the amount of fluid. That is, the condition was originally hæmatosalpinx, but subsequently changed to hydrosalpinx ; in fact, this is probably the history of most of the larger tumors which are classed under the former head.

The blood remains in a fluid state for an indefinite period. Klebs attributes this peculiarity to the influence of the tubal secretion, which he compares to the vaginal mucus in its property of preventing the coagulation of menstrual blood. It seems fair to explain this as partly due to the constant increment of serous fluid from the wall of the tube. But whether the addition is blood or serum, it is certain that a hæmatosalpinx tends to gradually increase in size, especially if it is associated with retained menses. In some cases the serum is largely absorbed, while the blood-corpuscles and coloring matter remain. The blood usually has the thick, tarry consistency which character-

izes retained menstrual discharges; sometimes it is so thick as to resemble a coagulum.

As its contents increase the enlarging tube changes its position, provided that no imprisoning adhesions have yet formed; situated at first laterally with regard to the uterus, it becomes more tortuous, and may sink downward behind the broad ligament, surrounding and fused with the ovary. Large tumors, according to Winckel, usually lie above the uterus; under these circumstances the tube must be fixed by adhesions before it has reached a considerable degree of dilatation. As the formation of a hæmatosalpinx presupposes the closure of the distal end in consequence of localized peritonitis, it is probable that the ultimate position of the dilated tube is determined by the position in which it is fixed by the primary peri-salpingitis; its shape and site may be further modified by subsequent inflammatory processes. This question of the environment of diseased tubes will be discussed later.

The changes in the wall of the tube deserve mention. During the early stage of dilatation it becomes hypertrophied, especially the muscular coat, but as the distension becomes excessive atrophy takes place, the wall becoming so thin that rupture is imminent. The mucous membrane atrophies, not always generally, but in spots. But intrinsic changes also occur; inflammation and fatty degeneration further aid to weaken the wall, which has now entirely lost its contractile power. The inflammation affects the peritoneal covering of the tube by direct continuity, and a secondary peri-salpingitis still further distorts the mass. Dense adhesions, completely surrounding the weakened wall, doubtless strengthen it to some extent, so that rupture does not occur. This accident is less frequent than is commonly supposed, and is more often the result of manipulation than of natural causes. Traction on the adherent tubes in consequence of the rapid emptying of a hæmatometra is mentioned by German writers as a frequent cause, but American gynæcologists have not been deterred from immediate evacuation of retained menstrual blood by fear of this accident, which, in their experience, has been rare.

The result of the rupture is determined by the character of the fluid which escapes. If it consists of blood, or blood and mucous secretion, it may form a retro-uterine hæmatocele, which becomes encysted; but if ulceration of the wall of the tube takes place and a purulent fluid comes in contact with the peritoneum, fatal peritonitis is the natural consequence. " It is not the blood in itself," as Hennig observes, " but the secretion of the tube which is mixed with it, that gives to the blood effused into the abdominal cavity its capacity for exciting inflammation." Cases have been reported in which the dilated tube discharged its contents into a neighboring viscus to which it had become adherent. There are doubtless some instances in which a hæmatosalpinx empties

itself into the uterus after the atresia of the latter has been overcome, but even if the tube is emptied, such extensive changes have taken place within and around it that their results remain permanent. It is also possible that such a tube may refill and discharge its contents at irregular intervals into the uterus when sufficient fluid has accumulated to overcome the obstacle formed by the narrow uterine orifice. This fluid would be of a serous or sero-purulent, rather than a sanguineous, character. It is also affirmed by some writers that a retro-uterine hæmatocele may discharge into the uterus through a tube.

It may be safely affirmed that as a rule an hæmatocele does not discharge itself in this way or undergo spontaneous cure, since not only is the lumen of the tube obstructed by internal and external cicatrices, but the fluid is too thick to flow readily through the uterine end. That the distal opening should remain patent is contrary to the entire theory of the mode of origin of this condition.

SYMPTOMS AND DIAGNOSIS.—We may divide tubal hemorrhages into two varieties—effusions limited to the tube alone, and collections of blood accompanying hæmatometra and hæmatokolpos. The symptoms presented by slight hemorrhages into the unobstructed tube are either *nil*, or are so little characteristic as to be overlooked, even by those who are skilled in detecting obscure pathological conditions of the internal genitals. The sudden discharge of a quantity of retained or disintegrated blood toward the end of the menstrual period has been regarded by some competent observers as an indication that blood retained within the tube has been forced into the uterus. If this phenomenon is preceded by colicky pains in the region of the tube, and the latter is felt to be enlarged before, and diminished in size after, the discharge, the evidence is regarded as quite conclusive. It must be confessed that there is ample room for error in such observations, as the blood may have been retained within the uterus, and the change in the calibre of the tube may have been merely apparent.

Hæmatosalpinx gives rise to symptoms which closely resemble those of hydrosalpinx (*q. v.*). The tumor has essentially the same form and relations, but in the case of hæmatosalpinx an increase in its size can be detected at the menstrual period, as fresh blood is effused into the sac. Rupture of the tube is more common in the latter condition, on account of the sudden increment to its contents. Consequently, the appearance of symptoms of collapse and internal hemorrhage at the time of menstruation in a patient with an enlarged tube (assuming that the history of the case excludes extra-uterine pregnancy) might point to the rupture of a hæmatosalpinx rather than a hydrosalpinx. However, the majority of the cases examined post-mortem in which blood escapes into the peritoneal cavity are doubtless early tubal pregnancies which are not recognized.

When associated with retention of blood in the uterus and vagina the diagnosis of hæmatosalpinx is less uncertain. The presence of an elongated tumor on one or both sides of the enlarged uterus, which gradually increases in size and gives a more or less distinct sense of fluctuation, could hardly possess any other significance. It is unnecessary to say that in such cases the symptoms presented by the distended tubes in their efforts to expel their contents are masked by those referable to the hæmatometra.

PROGNOSIS.—Slight effusions of blood into the tube are doubtless completely absorbed. Circumscribed interstitial hemorrhages possess less significance than do those in the ovary, as the wall of the tube is so much more simple in its anatomical structure   The blood is entirely absorbed, or its site is indicated by microscopic deposits of pigment.   In a certain proportion of cases a single hemorrhage may form the starting-point of hydrosalpinx. As the fluid accumulates in hæmatosalpinx the wall becomes thinned through pressure and fatty degeneration, and rupture is imminent.   This may take place into the peritoneal cavity, forming hæmatocele, or if, as usually happens, peritonitis is set up, the sac may become adherent to some hollow viscus, and may subsequently rupture into it.   Suppuration of the contents of the tube is a possible contingency, when the already thinned wall may be perforated and fatal peritonitis result.   The danger is greater in this case than in pyosalpinx, as the suppurative process is more acute in hæmatosalpinx, and the wall of the tube has already been atrophied by long pressure.

The danger from rupture of the tube after sudden evacuation of retained menstrual blood in cases of atresia uteri is due not to contraction of the muscular wall of the tube in its efforts to force the retained blood into the uterus (the wall has become so atrophied as to lose its contractile power), but to the tearing of the adhesions around the tube by the rapidly-contracting uterus, which results either in immediate rupture or in inflammation and subsequent perforation.

In general, hæmatosalpinx may be regarded as a serious condition, second only to pyosalpinx; indeed, from its proneness to rupture it may be regarded as in one sense more serious than the latter, since it may terminate life more suddenly.   When our knowledge of tubal pathology becomes more exact we may place pure hæmatosalpinx on nearly the same level as tubal pregnancy. But blood long retained and decomposed within a tube will excite primary peritonitis when effused into the abdominal cavity, which is less apt to result from the fresh hemorrhage that follows rupture of an ectopic sac.

TREATMENT.—Puncture of a hæmatosalpinx with an aspirating needle is only advisable when the sac is easily accessible through the vaginal fornix, and then simply as a diagnostic measure. As soon as the

tumor is recognized as a blood-cyst, no attempt should be made to withdraw its contents. Aspiration through the abdomen is a procedure which is opposed to modern principles of surgery. Laparotomy is the only recognized treatment of this variety of tubal enlargement, as of every other. In fact, all operators of large experience can recall cases in which a supposed typical pyosalpinx proved to be a hæmatosalpinx. As it is impossible and unnecessary to attain absolute accuracy in the diagnosis of these affections, so it is unwise to recommend palliative measures.

After retained menstrual blood has been successfully evacuated, and the tube (as commonly happens) remains dilated, it should be removed without delay, since the patient's danger is scarcely less imminent than it was before the uterus was emptied. In the light of modern teaching we may go a step farther and advocate the immediate performance of laparotomy in cases in which rupture of the tube results from the rapid evacuation of hæmatometra.

HYDROSALPINX.

PATHOLOGY.—This condition, which has also been termed tubal dropsy (hydrops tubæ), is simply a sequence of catarrhal salpingitis, like hæmato- and pyosalpinx—*i. e.* dilatation of the tube, and the accumulation within it of a quantity of serous fluid. The difference between these three forms of dilatation is often a difference in name

FIG. 308.

Double Hydrosalpinx (Bandl).

alone, since the contents of a so-called "hydrosalpinx" may be sanguineous or muco-purulent. But there are other features peculiar to the latter condition which render it essentially different from the other

two, so that we may properly regard hydrops tubæ as an enlargement of the tube *sui generis,* originating like the others, but much less serious to its possessor.

Hydrosalpinx has been described as a form of retention-cyst—an analogy probably suggested by the distension of the vermiform appendix from accumulation of mucus; but this comparison is inaccurate, since dropsy of the tube is not a mere accumulation of the normal secretion of mucous membrane, but is the result of a true inflammatory process. It is not necessary that there should be entire closure of one or both openings in order that a considerable amount of mucus may be retained in the tube; the swelling of the mucosa alone may be enough to hinder the outflow, but such an accumulation alone does not constitute hydrops tubæ. There must be actual pathological changes in the wall of the tube which permit it to dilate under the pressure of the retained fluid; to this end one or both ostia must be closed. If both are occluded, the condition is that termed by Froriep *hydrops tubæ occlusæ*—*i. e.* the entire tube is dilated; if the uterine opening remains patent, so that the accumulated fluid under increased pressure can escape into the uterus, he terms it *hydrops tubæ apertæ.*

Angular flexion in the outer third of the tube, or strictures due to peritonitic adhesions, may also form an efficient obstruction to the escape of fluid from the ostium abdominale. The commonest cause of tubal obstruction is closure of the distal opening in consequence of a localized inflammatory process which has resulted in agglutination of the fimbriæ or adhesions of the same to the ovary. Tait refers to the latter as being "perhaps of congenital origin, but more probably the result of inflammation." In both instances the occlusion is to be referred to catarrhal salpingitis, which in the latter case did, in the former did not, give rise to localized peritonitis of a less severe grade than that which attends purulent inflammation of the tubal mucosa. The frequent occurrence of double hydrosalpinx naturally suggests a common inflammatory origin in both tubes. It is not necessary to assume, with some writers, that the contents of the tube escaped into the peritoneal cavity through an ulcerative perforation or by transudation through the tubal wall.

In addition to causing closure of the ostium abdominale, the primary peritonitis (so termed in order to distinguish it from that which develops *after* the dilatation of the tube) may also cause flexions and strictures at one or more points in the course of the tube. The tubal wall has already been softened by the catarrhal process, so that it yields readily to the gradual pressure exerted by the accumulating fluid, becoming uniformly thinner by reason of muscular atrophy. The initial step in the dilatation may be a moderate effusion of blood into the tube (see Hæmatosalpinx), or the retained fluid may be increased by hemorrhage

from rupture of a vessel in the thinned muscular coat. The hydro-
salpinx may become a pyosalpinx from secondary ulceration of the
wall and consequent admixture of pus.

The shape assumed by hydrops tubæ varies according as the entire
tube or only a portion of it is distended, and as it is free or distorted
by surrounding adhesions. The more distensible outer half of the

Fig. 309.
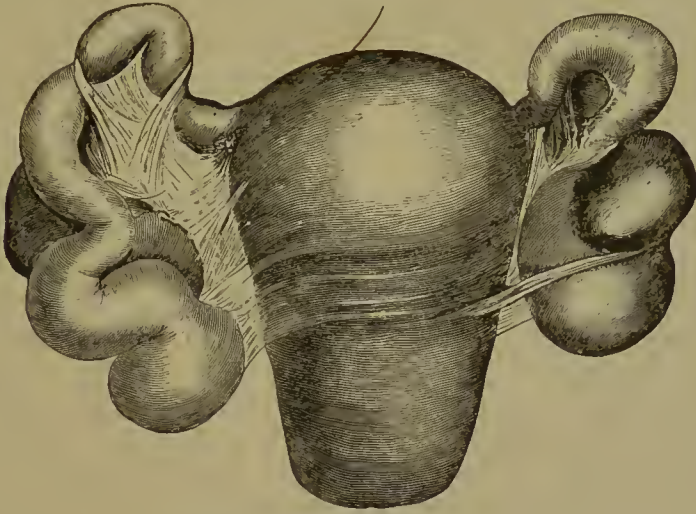
Double Sacculated Hydrosalpinx (Bandl).

tube enlarges first, and if perfectly movable it presents a tense cylin-
drical or ovoid sac (see Fig. 308), which sinks downward behind the
corresponding broad ligament. If a constriction exists at the middle
or outer third of the tube, the swelling is more nearly globular, the
remainder of the tube being of normal calibre. The tube is some-
times bent or constricted at several points, so that separate collections
of fluid are formed. Rokitansky has called this form *hydrops tubæ
saccatus.* (See Fig. 309.) The inner third of the tube is not usually
dilated, since the flexion near this point, caused by the bending of
the distal portion from its increased weight, prevents the accumulated
fluid from passing beyond the bend until the pressure has become
extreme, when a portion of it may be forced into the uterus. It should
be noted that the adhesions around a pure hydrosalpinx are seldom so
firm and extensive as those associated with pyosalpinx, for the reason
that the fluid discharged from the tube at the time of the primary
inflammation was less irritating, and the comparatively bland nature
of the retained secretion is less likely to cause recurrent attacks of peri-
tonitis. (See Pyosalpinx.)

The whole appearance and relations of hydrosalpinx are different
from those of purulent distension. Instead of being a general cylin-

drical hypertrophy of the tube, which gives only a doughy sensation, or at the most imperfect fluctuation, the former is a pyriform cyst, with thin, often translucent, walls and a tense fluctuating feel. The exterior of a hydrops tubæ is seldom covered with a thick layer of organized lymph or presents a ragged sloughing appearance. A "pus-tube" is nearly always buried in adhesions, tube and ovary being fused together, so that their identity is often lost. The ovary is either completely atrophied or extensively diseased, whereas hydrosalpinx may be associated with but little, if any, trouble in the corresponding ovary. The tube may, however, be united to the latter by adhesions of moderate firmness.

With regard to the dimensions which a hydrosalpinx may attain, authentic reports state that the tumor has reached the size of a child's head; Peaslee withdrew twenty-two and a half pounds of serous fluid from a distended tube which during life was tapped several times as an ovarian cyst. The average specimen is not larger than a small pear, and is slightly constricted at two or three points. (The association of hydrops tubæ with cystic enlargement of the ovary will be considered under Tubo-ovarian Cysts.)

Dilated tubes are usually found in the posterior pelvic fossa near the bases of the broad ligaments and behind the ovaries; it is only the rare tumors of large size that rise out of the pelvis.

In an examination of a typical specimen the following points will be noted: Although the tubal wall is generally thinned, at some points there may be actual hypertrophy, with or without additional thickening from external deposits of lymph. At the lower end of the sac traces of the ostium abdominale are seldom absent, even when the fimbriæ have entirely disappeared. The latter may be rolled into the tube, and may be imprisoned there when it is obliterated, or they may unroll again and remain like a fringe on the surface of the cyst, surrounding the site of the opening; in some cases the latter exists only as a small cicatrix on the surface of the sac, no traces of peri-salpingitis being present. By straightening out the various bends in the tube and squeezing the sac, fluid can usually be forced into the uterus. On laying open a hydrosalpinx it will be seen that its wall is not of uniform thickness. The distal portion of the tube, having been exposed to greater pressure than the proximal, and for a longer period, may be very much thinned, while the latter may be even thicker than normal in consequence of inflammatory swelling. In the most distended portion the mucous lining has lost its rugæ, and may be so atrophied that it cannot be distinguished as a separate layer. It may be colored reddish or brownish in spots by deposits of blood-pigment (marking the site of punctate hemorrhages), or may present a yellowish appearance by reason of fatty degeneration. Necrosed spots may sometimes be observed, with

evidences of imminent rupture. Where the distension is less the mucosa may be preserved and exhibit the usual changes due to chronic catarrh. The papillary growths described in the interior of such cysts are simply the results of hypertrophy of the mucous membrane analogous to that seen in endometritis fungosa. The muscular layers are much thinned from pressure alone.

The fluid contents of hydrosalpinx vary in character from a thin, clear, watery liquid to a thick brownish one. The color depends upon the presence or absence of blood, fatty degenerated epithelium, and pus. A typical specimen has a yellowish color, rather a low specific gravity, an alkaline reaction, contains a large quantity of albumen (thus differing from the fluid contained in a parovarian cyst) and paraglobulin, occasionally a little chloride of sodium. Microscopically, it sometimes contains pigment and cholesterin, and nearly always quantities of columnar ciliated epithelia, the latter in greater numbers than in parovarian fluid. The importance of this fact (and the presence of albumen and paroglobulin), in connection with the diagnostic vaginal puncture of a small cyst in Douglas' pouch, is self-evident.

Fig. 310.
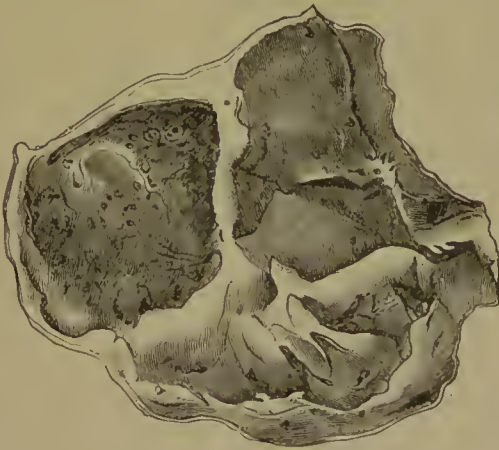
Hæmatosalpinx: Interior of Cyst.

Microscopical sections of the wall of the sac show nothing of particular interest. In some places the epithelial cells have undergone fatty degeneration and are disintegrated, while in others they have disappeared entirely. Atrophy of the muscular coat, with separation of the bundles, is seen. Collections of pigments will be noted in the submucous layer. There is a general atrophy of the vessels in the thinnest portion of the wall, with dilatation of those in other parts of the sac. Sections through the undistended or slightly dilated portions of the tube show the changes characteristic of chronic catarrhal salpingitis.

The subsequent history of hydrosalpinx is important from its bearing on the prognosis. As before stated, where the uterine end of the tube remains open the pressure of the retained fluid may be so great as to overcome the obstacle caused by a flexion at the proximal end, so that a portion of the contents of the sac escapes into the uterus. This increase in the pressure may be sudden (hemorrhage or menstrual congestion); cases are recorded in which the fluid was thus forced out by mechanical violence, as by a fall or a blow. A periodical flow from the uterus of fluid from a dropsical tube has been noted during or immediately after menstruation; Klob believes that in women who have passed the menopause this phenomenon may simulate menstruation. Rupture of the sac is always possible, since pressure, fatty degeneration, and necrotic processes may reduce the wall to extreme thinness, so that a sudden increase in the amount of fluid (as from a moderate hemorrhage) might easily cause it to give way. If the fluid is purely serous, it may be absorbed by the peritoneum, and no harm may result; but, from what has been said, it is evident that we can never know when the fluid has ceased to be innocuous, by reason of the addition to it of pus or blood. An acute septic inflammation may extend from the undilated portion of the tube to the lining of the sac and its contents, transforming the bland into an extremely acrid fluid, contact of which with the peritoneum would mean death to the patient.

The practical deduction is that hydrosalpinx is a serious condition, and should be treated surgically. Puncture is not a rational method of dealing with it, since the fluid not only reaccumulates, but may assume a purulent character after tapping. Adhesion of a hydrosalpinx to the intestine or bladder, with subsequent ulceration and discharge of its contents, has been reported; in such cases it was undoubtedly transformed into pyosalpinx before the perforation occurred.

II. SALPINGITIS.

By W. GILL WYLIE, M. D.

HISTORY.—Medical literature, as far as I have been able to examine it, furnishes only two or three references to diseases of the Fallopian tubes previously to the nineteenth century, and nothing of much importance till 1823. In that year James Blundell, as shown in *The Transactions of the Royal Medical and Chirurgical Society of London,* after having experimented on animals, claimed that the uterine appendages, and even the uterus itself, could be removed without causing death, and he proposed that these organs or any parts of them should be removed for disease when other treatment failed. We have found no evidence that his suggestions were ever carried out.

Previous to 1857 we find, in the writings of Sager, Froriep, Kiwisch, Förster, and others, observations on the pathology of the Fallopian tubes. In that year, in the *Archives générales de Médecine,* appeared the first account of Bernutz's remarkable researches on the nature and pathology of pelvic inflammations. He clearly described the disease clinically, and he showed, pathologically, that it was a disease of the tubes and ovaries accompanied by peritonitis, and that cellulitis had no influence in causing the symptoms, and that it rarely existed except as a phlegmon in puerperal cases. This is the accepted doctrine of to-day—in the past two or three years made plain by hundreds of operations for the radical cure of that large class of cases until recently regarded and treated as chronic cellulitis. The publication of Bernutz's work in 1857 was succeeded by numerous records of autopsies showing the relations of the tubes to puerperal sepsis, and minute descriptions of the pathology of salpingitis—for instance, in the writings of the older Martin, Scanzoni, Förster, Voche, Barnes, Klob, C. Hüter, Wagner, and others. In 1872 the question of practical surgical treatment began to be considered. C. Hennig gives us perhaps the most complete and minute account of the pathological anatomy of the Fallopian tubes.

On July 27, 1872, Hegar of Freiburg, Germany, removed the tubes together with the ovary, but the operation was done for dysmenorrhœa and ovarian neuralgia. In the same year Battey of Rome, Ga., removed the ovaries for similar reasons; but in his earlier writings, as far as I know, he does not refer to diseases of the Fallopian tubes. Lawson Tait, of Birmingham, Eng., also claimed to have removed the Fallopian tubes for disease as early as 1872, and, among English-speaking people certainly, he has done more than any one else, by

his writings and his remarkable surgical skill, to place the operation for the removal of diseased Fallopian tubes on a lasting foundation.

Previous to 1871 American medical literature contained only about a dozen direct references to diseases of the Fallopian tubes, and these are chiefly reports giving accounts of autopsies in which diseased tubes were found. In the *Boston Medical and Surgical Journal* of that year appeared an account of Hennig's anatomy and pathology of the Fallopian tubes, but among gynecologists the subject was not practically taken into consideration for study or treatment.

During 1872 and 1873, I was interne at the New York State Woman's Hospital, then considered the fountain-head of gynecology in America, with J. Marion Sims, T. A. Emmet, T. G. Thomas, and E. R. Peaslee as visiting surgeons. At that time salpingitis was treated as cellulitis or ovaritis. I am certain that no instruction about diseases of the tubes was given, nor was the subject accorded much consideration. During my term of service Dr. Thomas removed an hypertrophied clitoris with the galvano-cautery. The patient did well until the thirteenth day after the operation, when she suddenly developed general peritonitis, and died in twenty-four hours. I was present when the autopsy was made. The physician who acted as pathologist pronounced the disease peritonitis due to the bursting of an abscess of the right ovary. Later I removed the generative organs completely, and took them to my room for examination, and discovered that it was the right tube instead of the ovary that had burst and caused the peritonitis, and that the left tube was also distended to the size of a large lemon with a greenish-colored fluid. I made an exact drawing of the specimen and reported the case in the *American Journal of Obstetrics*, vol. vi. p. 43. That was about all I learned of salpingitis during my service.

In 1876, in the *Transactions of the Gynecological Society*, Dr. Noeggerath published his views on latent gonorrhœa, which had appeared in 1872 at Bonn. His views on gonorrhœal salpingitis attracted general attention, and their acceptance in a great measure accounts for a belief more or less prevalent that gonorrhœa causes nearly all serious diseases of the Fallopian tubes. This, I think, is erroneous, as sepsis after abortions and labor, and the use of pessaries, unclean sounds, etc., are by far the most frequent causes of salpingitis.

The writings of Battey on removal of the ovaries prepared the way for the ready acceptation of the teachings of Lawson Tait in the United States. Previously to 1882 many of us performed what we termed oöphorectomy, or Battey's operation, for the relief of reflex nervous troubles, dysmenorrhœa, and neuralgia, but not until that year can I find a case reported in this country where the operation was done for salpingitis. Many cases of diseased and ruptured tubes revealed in

autopsies had been reported, but operations on such subjects of pelvic inflammation as had repeated attacks of what we then called pelvic cellulitis were not considered justifiable.

In May, 1883, I operated for the first time for the removal of diseased Fallopian tubes. The case was an unmistakable one, for I could by pressing on the tubes cause pus coming directly from the uterus to show itself in the vagina. An eminent scholar, who, with a number of gynecologists, was present, said, after having examined the specimens, that the conditions of the case came nearer to justifying the operation than anything he had seen. This gynecologist now not only operates for the removal of diseased tubes, but he told me only a few days since that he had resorted to abdominal sections for retroversion without disease of the appendages.

In the same year Dr. T. G. Thomas published in the *New York Medical Journal* "A Contribution to the Subject of the Removal of the Uterine Appendages (Tait's operation) for prolonged menstrual troubles with recurrent pelvic inflammation."

During 1883–84 numerous cases operated on for salpingitis were reported by various gynecologists and surgeons, and the subject was one of the leading topics at society meetings. In January, 1885, I read before the New York Academy of Medicine a paper on "The Etiology, Symptoms, Pathology, and Treatment of Diseases of the Fallopian Tubes," reporting fourteen cases operated upon and showing the specimens of each case.

Gynecologists who a few years ago denounced the operation for the removal of diseased tubes are now eagerly seeking cases to operate upon.

Previous to the appearance of Tait's papers in our American journals, as is shown by the approximately complete bibliographical table on salpingitis appended to this paper, operations on the appendages for causes other than cystoma were nearly always termed "oöphorectomy," and little or no importance was attached to diseases of the Fallopian tubes.

It is almost incredible that so grave and common an affection as salpingitis should have been for so long a time, if not unknown, at least not practically considered and treated. One might well ask what was done for these cases in the past and how they were classed. Nothing could be clearer than the demonstrations of Bernutz and Goupil thirty years ago concerning the nature of salpingitis; but the difficulty was that any local treatment in cases that can be diagnosed, except removal by abdominal section, was of little value. Until the teachings of Lister and others showed the importance of cleanliness in surgery, especially abdominal surgery, this procedure was too dangerous to life to be of much practical benefit. Had not there been a steady advance

in surgery since 1872, the pioneer work of Battey, Tait, and Hegar
would in all probability have sunk into obscurity or have made a
much slower advance. There is no doubt that cases of salpingitis
were not less numerous twenty years ago than to-day, for septic influ-
ences, not being then understood, were much more prevalent; and it
is plain to us to-day not only that local treatment for uterine disease
frequently "lighted up" fresh attacks of "old cellulitis" (known, nine
times out of ten, to be local peritonitis due to salpingitis), but that the
septic fingers, sounds, and pessaries—especially stem-pessaries—sent
home to chronic invalidism hundreds and even thousands of women
who had come to us for some comparatively trivial uterine affection.
In this country, at least, before 1882–83 characteristic cases of sal-
pingitis were very common, and went under the name of pelvic cel-
lulitis. If the ovary happened to be large enough to be made out
by examination, they would sometimes be called ovaritis. If the
uterus happened to be markedly displaced backward and fixed or
twisted to one side, they were termed cases of retroversion or lateral
version with adhesions, and they were treated as though the displace-
ment was not only the chief disease, but the only one to be treated.
We were taught to replace the uterus and keep it in the ideal normal
position, and to believe that if we could do so the affection would be
cured. If the *soft pessary* caused a septic endometritis and salpin-
gitis and renewed the local peritonitis, or if the uterine repositor used
forcibly to replace or move the adherent uterus burst a distended tube
and caused a peritonitis, we were told that we had "lighted up an old
cellulitis," but that we should not be discouraged. The patient was
directed to be put to bed and dosed with anodynes until the acute attack
subsided. She was then sent home for six months or a year, to remain
in bed or to take such exercise as her ailment permitted. She was
ordered hot water as a vaginal douche every day, and was directed to
return to have the uterus pried up. The previous treatment was con-
tinued until the so-called cellulitis again started up or her money or
her faith was gone. This routine has been somewhat modified, but
these cases of salpingitis are by some still called cases of cellulitis, and
treated by rest, local applications of iodine to the vault of the vagina,
and hot-water douches, month after month, without any real benefit
except the delaying of acute attacks. Thus, the woman is always a
patient, struggling to keep comfortable and waiting for the menopause
or for death from pelvic abscess and peritonitis.

Comparatively young men are still teaching the use of soft-rubber
pessaries and advocating the use of the uterine repositor where the
uterus is bound down by adhesion—a condition now well known to be
associated with salpingitis. I am satisfied that a careful study of the
diseases of the Fallopian tubes will clear up not only most of the

numerous cases of local peritonitis once regarded as incurable, but also most of the cases of retroversion, retroflexion, and lateral flexion with adhesions, and that their proper treatment will make plain the uselessness and danger of pessaries in such cases. I do not mean to say that every case of local peritonitis will be found due to salpingitis, but that, in the large majority of cases, salpingitis precedes the local peritonitis, and that repeated attacks of local peritonitis are, as a rule, caused by salpingitis.

In my opinion, when the frequency and the gravity of diseases of the Fallopian tubes are generally understood, the occupation of the mechanical pathologist—who assumes that most of the ills of women are due to uterine displacements, and that their ailments will be overcome when version or flexion is corrected and the uterus held by a pessary in an ideal normal position—will be substantially gone.

ETIOLOGY.—It is difficult to conceive a salpingitis starting up as a primary disease independent of any disease of the uterus or ovaries. It is generally conceded that it is due, in almost all cases, to the extension of inflammation from the uterus to the Fallopian tubes, and that endometritis, whatever be the cause of it, is liable to result in salpingitis.

Previously to puberty and functional activity of the generative organs endometritis is rare, and we do not expect to find salpingitis. Certain congenital deformities may lead to disease of the tubes, such as occlusion of the vagina or os uteri. The menstrual blood, not finding an outlet, may distend the uterus, and finally be forced into the tubes, and be followed by irritation sufficient to cause adhesions and occlusion of the fimbriated extremity. This distension of the tubes greatly adds to the danger of evacuating the blood by operation, for the tubes may burst during the operation and cause peritonitis, or should sepsis follow the operation we have not only septic endometritis, but septic salpingitis, to deal with.

In imperfectly developed and delicate girls and women the mucous lining, in its degenerated state, becomes an easy prey to catarrhal disease, and an endometritis may extend to the tubes. But in my own experience salpingitis is rare when developed in virgins to a degree which necessitates operation for removal; and when I find enlarged and diseased tubes in these patients I expect to find tuberculosis, unless the anteflexion so common in these cases was treated by the use of a stem-pessary and was followed by a so-called attack of cellulitis.

It is probable that unless the tubes have been enlarged by pregnancy endometritis is not liable to extend to the mucous lining of the Fallopian tubes. On a careful study of my cases operated upon, now numbering 130, only about 10 per cent. could claim to be virgins,

and in the great majority the salpingitis could be plainly traced to septic endometritis following abortion or labor.   After abortions the cervix uteri is not so patulous as after labor at term ; the cervix is more irritable and likely to contract and to obstruct drainage ; any effete matter may be retained in the cavity of the uterus, and when the uterus contracts it may be forced into the Fallopian tubes.   It may be a disease of the endometrium that caused the abortion, and this dis- ease may extend to the tubes.   Besides, after abortions neither the patient nor the doctor is so likely to take the usual precautions against sepsis or to give time for involution to take place.   Subinvolution and endometritis are much more common after abortion than after normal labor.   After labor or abortion, when the uterus is enlarged and soft, retroversion is more likely to complicate endometritis and make the extension of disease into the tubes more liable to occur.   Septic endo- metritis, which results in dangerous puerperal fever, often proves fatal by extending from the uterus through the tubes to the peritoneum.   As long ago as 1859, Martin of Berlin clearly described these cases and demonstrated them by numerous autopsies.   It is a fact that before the days of antiseptics a very large percentage of lying-in cases had more or less rise of temperature ; and we know now that this rise of temper- ature is, as a rule, due to sepsis, and in all probability to septic endo- metritis.   In my opinion, the majority of cases of salpingitis requir- ing operation are caused by septic endometritis following labor and abortion.

Until recently gonorrhœa in women was considered a trivial disease, probably because it does not produce urethral stricture, as it does in the male ; but the writings of Noeggerath and a more practical knowledge of salpingitis have made it plain that it may prove to be a very dan- gerous disease by extending from the vagina to the uterus and from the uterus to the Fallopian tubes and the peritoneum.

There is no doubt that gonorrhœa is frequently the cause of salpin- gitis, but I am inclined to think that its influence in this respect has been exaggerated.   It is true that salpingitis is a common disease among prostitutes, but abortions are almost universal with these women ; and the local peritonitis, which is by far the most reliable symptom of salpingitis, will be found to follow abortions much more frequently than it follows gonorrhœa.

Noeggerath's theory of " latent gonorrhœa " is attractive, but prac- tically it has not been proved.   Persons who have suffered from diph- theria may have more or less chronic throat affection, but we would not call the affection latent diphtheria.

Syphilis may cause salpingitis in the same way that it produces otitis or ozæna.   Endometritis in syphilitic subjects is often very difficult to cure.

Any abnormal condition that leads to hemorrhage into or on the tube may cause salpingitis. In operating for diseased tubes three times I have found extra-uterine pregnancy as the cause of salpingitis. I am inclined to think that in many other cases, especially where one side is badly diseased, conception, taking place in the tube, the tube bursting within a few days or weeks, has caused the local peritonitis and salpingitis, and that when operated upon the specimens were too much changed by the inflammation to be recognized as extra-uterine pregnancy.

We may safely say, then, that, with rare exceptions, salpingitis is caused by extension of disease from the endometrium to the mucous lining of the tube. It is true that we often operate for diseased tubes and find the uterus relatively free from disease, but the endometritis or acute disease causing the salpingitis may months, or even years, ago have passed off, leaving the tubes diseased.

But aside from tubal pregnancy, there is reason to believe that the tubes may become diseased without extension from the endometrium. Salpingitis, it is claimed, has accompanied some of the essential and eruptive fevers. Certain diseases of the ovaries which result in suppuration, such as dermoid cysts, may cause salpingitis by direct extension or by inflammatory exudations closing the fimbriated extremity. Pelvic hæmatocele and cancer may produce salpingitis in the same way.

Abnormal ovulation—that is, the formation of large cysts with irritating fluid in them—may in certain conditions of the general health result in inflammation, adhesions, and salpingitis. As a rule, we rather expect the ovary to become affected by the escape of septic fluid from the tube upon and about the ovary.

Anything that stops up or diminishes the lumen of the tube may obstruct drainage, cause distension, and result in salpingitis.

Intra-uterine injections may force poisonous or irritating fluid into the tube and produce inflammation. This may be caused by distension of the uterine cavity as well as by the force of the injection : the fluid, not escaping freely from the os uteri, or possibly by the force of a uterine contraction, enters the tube. In the hands of an eminent gynecologist, I saw a small No. 7 catheter used to give a uterine injection for sepsis following incision for dysmenorrhœa. A pint of fluid with two drachms of carbolic acid dissolved in it was forced by a syringe, as supposed, into the uterus, but when the bedpan was examined it was found that not one drop of the fluid had returned. The catheter had without doubt entered the Fallopian tube, and the solution had entered the abdominal cavity. Shock appeared before the injection was finished, and was followed by a dangerous attack of peritonitis, resulting in a pelvic abscess which finally opened into the bladder and entailed years of suffering.

Physical injuries, such as blows and falls, may excite acute attacks of local peritonitis by bursting or tearing tubes distended with septic or irritating fluids, or by bursting ovarian cysts; but it is doubtful whether so small and movable an organ, if normal, protected as it is by the bony pelvis and soft tissues, can be seriously injured by a fall or blow that would not at the same time kill the patient.

I have in several cases found the vermiform appendix firmly adherent to a diseased tube, and it seems probable that a perityphlitic abscess might involve the right tube and cause salpingitis.

Not the least important cause of salpingitis is want of cleanliness in the hands, sponges, and instruments of physicians making local examinations or operating on cases of uterine disease, and thus starting up septic endometritis. Sponge tents and other kinds of tents used to dilate the uterus are especially likely to cause septic endometritis or to cause septic or irritating fluid to be forced from the uterus into the tubes by preventing its drainage or escape from the os uteri, especially when the irritation of the swelling tent brings on violent uterine contractions, as it nearly always does. All of us can look back ten or fifteen years and remember how commonly a severe chill with fever followed the use of uterine tents, especially when they were renewed several times in succession; but we called it "cellulitis," and kept on using these unsurgical and dangerous instruments even when rendered aseptic. Since the introduction of good steel uterine dilators the tent is becoming, and should become, obsolete.

Next to the uterine tent comes the equally unsurgical and dangerous vaginal, and especially uterine, tampon. Before the days of antiseptics the tampon caused hundreds of cases of salpingitis every year. Like the tent, it violates what is, next to cleanliness, the most important law of surgery—namely, drainage. Besides, it is frequently used in just the class of cases most liable to become septic, and is most dangerous to life when sepsis begins, such as in hemorrhage after abortions, etc. To-day an expert surgeon who knows how to use hot-water irrigation alternated with ice-water, or to bring on uterine contraction by the use of Churchill's iodine, or how to pass a needle so as to constrict the uterine artery, need rarely if ever resort to a vaginal, and never to a uterine, tampon to stop uterine hemorrhage. Empty the uterus of retained matter or new growths and stop hemorrhage without using any kind of tampon. Tampons can be and should be abandoned. Used in the ordinary way, they rarely ever stop a dangerous hemorrhage.

SYMPTOMS AND DIAGNOSIS.—*Subjective Symptoms.*—Acute salpingitis is so frequently associated with uterine disease that a diagnosis is not always easily made. Perhaps the most reliable indication of severe salpingitis is the occurrence of repeated attacks of local peritonitis, but

during the acute stage an attack of acute metritis, when the uterus is enlarged, so closely simulates local peritonitis that time alone enables one to make a clear diagnosis. In each disease the same pains and sensitiveness occur, and, except under ether, the uterus will seem to be fixed in the pelvis. With a severe metritis there are without doubt frequently associated salpingitis and local peritonitis. As a rule, an excessive or prolonged menorrhagia or metrorrhagia takes place during the acute stage of salpingitis. Wet feet and exposure to cold may be exciting causes by suppressing menstruation and inducing a catarrhal endometritis; but when exposure is followed by peritonitis I would always look for a latent salpingitis or some equivalent cause of the disorder.

The subjective symptoms of chronic salpingitis are very variable. A peculiar burning pain over the seat of the tube affected is perhaps more characteristic than any other symptom; but many patients do not have it. Local sensitiveness and a dull pain over the tubes and ovaries are about the only constant symptoms. A dragging pain or sensation when the patient stands, or backache and headache, which are supposed to arise from displacement, and which are so commonly associated with, and often due to, the diseased tubes, are sometimes present.

Dysmenorrhœa is a common symptom, but in some cases the flow gives relief by lessening the congestion. I am inclined to believe that the pain is often caused by the endometritis or by the contraction and hyperæsthesia of the mucous membrane which accompany it, for where stenosis and endometritis are cured the dysmenorrhœa, as a rule, disappears. In cases where the disease is mainly in the tubes and ovaries the pain comes on a week or ten days before menstruation, and is mitigated when the flow begins, and with a free flow may disappear entirely. Menorrhagia or metrorrhagia is often associated with salpingitis, but in chronic cases I think it will most frequently be found to be due to vascular changes in the lining membrane of the uterus; and a thorough curetting with a good instrument may effect a cure, although great care must be exercised in preparing the case for operation, lest the salpingitis be so disturbed as to start up peritonitis.

Sterility is the rule in salpingitis. When both tubes are affected—which is usually the case—it is incurable; but when only one side is affected and the proximal end of the tube of the diseased side is closed, pregnancy is possible and may go to full term; but as the uterus enlarges there may be severe local pain, and abortion is likely to occur.

Objective Symptoms.—In acute cases there are usually so much swelling and tenderness that about all we can make out is a fulness or thicken-

ing of one or both broad ligaments, associated with more or less fixa-
tion of the uterus. In such a case the patient should be kept in bed
until the painful symptoms subside. Then place thin pledgets of
cotton saturated in a mixture of boroglyceride one part and pure gly-
cerin fifteen parts against the cervix uteri two or three times a week,
and, as the case becomes subacute, add alum to the mixture and con-
tinue the pledgets for from three to eight weeks. The inflammatory
products will be so much absorbed or stretched that the uterus will
become more movable, and an expert may be able to define an enlarged
tube or a mass which contains a diseased tube or ovary more or less
prolapsed and adherent in one or both broad ligaments. A diagnosis
may be more easily made in the subacute than in the acute form of the
disease, but a doubtful case can often be cleared up by the treatment
recommended for acute cases. It is especially easy when only one
side is affected and the uterus is not retroverted. Of course much will
depend upon the thinness and laxity of the abdominal walls, and now
and then a case will be found in which, to obtain a clear diagnosis, it
is necessary to examine the patient under ether. The floor of the
pelvis is occasionally so fixed by adhesions, and there is so much
venous congestion or enlargement of the pampiniform plexus, espe-
cially of the left side, that a specific diagnosis cannot be made ; a pro-
lapsus of or adhesions to the sigmoid flexure may augment the diffi-
culty. Tubes affected by catarrh are sometimes not distended and
cannot be made out by the sense of touch. In chronic cases the
ovaries are apt to be more or less cystic, or are often infiltrated and
enlarged by inflammatory products, and are nearly always prolapsed
with and folded under the tubes on either side.

Sometimes, when the proximal end of the tube is patulous, the dis-
charge will enter the uterus ; and I have seen one or two cases where,
from an accurate knowledge of the state of the uterus and vagina, it
could be made plain that the gleety discharge had come from the
tube. After cleaning the vagina and uterus fresh pus could be
made to appear in the vagina by slowly pressing upon the distended
tube. The fluid may escape intermittently into the uterus, and if irri-
tating may set up each time an acute endometritis. Now and then a
distended tube will empty a large amount of fluid into the uterus at
once. For the time the fluid flows freely from the vagina, and the
tube will refill and again discharge. In many doubtful cases an exam-
ination under ether will enable us to make out the enlarged tubes and
ovaries.

No attempt has been made to define the symptoms of the different
kinds of salpingitis. Aside from the difficulty of doing so, practically
we need only inquire whether salpingitis exists, and whether the case
is one that can be best treated by general and local treatment or by

operation. Since catarrhal salpingitis without adhesions or occlusion of the tubes cannot be diagnosticated by the sense of touch, and is usually associated with catarrhal endometritis sufficient to account for all the special subjective symptoms, it is very doubtful if it can be diagnosticated at all. Besides, it has not yet been satisfactorily determined what specific condition of the mucous membrane is to be considered abnormal. The amount of mucus and the appearance of the membrane will certainly be found variable on account of the effect of menstruation and of other conditions of the uterus which cause congestion or inflammation of that organ.

Practically speaking, it is very doubtful if we can consider the tubes diseased unless they are enlarged or the walls either greatly thickened or atrophied, or the cavity distended; and it is exceedingly rare to find either of these conditions without occlusion of the tubes and peri-salpingitis causing peritoneal adhesions. Any active disease of the tubes would in a short time cause such a hypersecretion of mucus that it could not be drained off through the uterine end, and would escape into the peritoneal cavity from the fimbriated extremity, and be almost certain to cause more or less local peritonitis, exudation, and adhesions.

In salpingitis the ovaries are frequently found diseased, and in the more severe forms if not actively diseased are so bound by adhesions that the process of ovulation is abnormal. The symptoms of the ovaritis cannot, however, often be distinguished from those of the salpingitis.

Having made the diagnosis of salpingitis, it is of great practical importance for us to be able to detect the beginning of an abscess or the rapid formation of pus in either the diseased tube or ovary. As a rule, the formation of pus is indicated by a chill or chilly sensations with rise of temperature, and by careful and regular examination the rapid increase in the size of the indurated mass about the broad ligaments can be detected. If left to nature, the mass will become more firmly encysted by peritoneal exudation, or it will increase in size and the pus will burst into the rectum, vagina, or the connective tissue of the pelvis, and point above the brim or through some foramen, or it will burst into the peritoneal cavity and cause general peritonitis.

The conical shape of the tumor or the elastic nature of the thin walls of the tubes may enable us to distinguish hydrosalpinx from pyosalpinx, and, as a rule, the local pain and subjective symptoms are not so severe or so acute as in pyosalpinx, but in many cases we are uncertain what we shall find until we open the abdomen.

Tyler Smith in 1849 claimed that he could catheterize the Fallopian tubes. Experiments made by Albers, Hennig, and others proved the

danger and impracticability of accomplishing any good by the use of sounds. We know that in the class of cases which might be benefited if we could successfully drain the cavity of the tubes through the uterus the slightest attempt to dilate or even sound the uterus may be followed by local peritonitis, and that in other cases the tubes are so tense and distended that very slight manipulation causes them to burst and the fluid to escape into the peritoneal cavity and prove fatal. It is extremely doubtful if anything can be done by catheterizing the Fallopian tubes which would not prove to be much more dangerous than beneficial.

PATHOLOGY.—To appreciate the pathology of the subject one must keep in view certain anatomical facts. The tubes are developed with the uterus from the ducts of Müller, and, like the uterus, have a mucous lining, a layer of longitudinal and one of transverse muscular fibres, and an outer covering of peritoneal tissue. The mucous lining is continuous with that of the uterus through a small opening, and it is covered with ciliated epithelium with the current from the ciliæ directed toward the uterus. The membrane lies in longitudinal folds, and appears to fill up the lumen, which at the junction of the tube with the uterus is about one line, and increases in size toward the fimbriated extremity. The muscular coat is given off from the cornua of the uterus on either side. The tubes are about $3\frac{1}{2}$ inches long, the left usually being the longer. They are covered by the same peritoneal fold which includes the broad ligaments, and they run along and form their upper border. They float in the pelvis at either side of the uterus and tend to drop backward when the patient is reclining. The ends open into the peritoneum and terminate in several delicate fimbriæ. One of these fimbriæ is attached to the ovary, which lies on the broad ligament just below the tube, somewhat nearer the uterus than the extreme end of the tube, and causes the end of the tube to turn in and backward to grasp the ovary. Beneath the tube in the broad ligament is the pampiniform plexus, a congeries of veins which is often included in the ligature passed to tie off the tube and ovary.

The broad ligament is stretched from the side of the uterus to the pelvic bones on either side, but is loose enough to allow of free motion of the uterus backward and forward, while limiting the lateral motion. To tie off all the tube and ovary to within half an inch of the uterus it is necessary to fold in a goodly part of the broad ligament, and when both sides are tied off the normal mobility of the uterus is for a time interfered with; but when completely healed the uterus is usually abnormally movable.

In studying diseases of the tubes it must not be forgotten that once every month the tubes, together with the uterus, become engorged with blood, and thus undergo a change likely to aggravate or disturb the

course of disease or repair; that about once a month ovulation takes place in one of the ovaries, and that the ovum, with a certain amount of serous fluid, escapes, and is supposed to be carried by the tubes into the uterus. It is also important to keep clearly in view the anatomical relations of the rectum and ureters to the broad ligaments and uterus.

As a rule, acute salpingitis will be found associated with either acute or chronic endometritis—catarrhal, specific, or septic.

Chronic salpingitis will be found nearly always associated with pelvic peritoneal adhesions involving the broad ligament, ovary, and frequently diseased ovaries.

Salpingitis is often found complicating dermoid, ovarian, and fibroid tumors, and will often account for the unusual pain felt in such cases.

Hennig, Bandl, and other German authors claim that catarrhal salpingitis is a very common disease, and state that when the tubes are examined in women who have died from other diseases the tubes, in a large percentage of cases, will be found abnormal, the mucous membrane swollen and softened, the outer edges reddened, and the mucus increased in amount and giving an acid instead of a normal alkaline reaction.

Since I am of the opinion that any disease of the tubes, except perhaps hydatids, very soon causes sufficient peritonitis to occlude the fimbriated extremity, I will not undertake to describe any class of cases except those that can be clinically verified. I have often in operating seen tubes which seemed excessively vascular and somewhat enlarged, and in which the mucus seemed abnormal, but I am still doubtful whether they were diseased sufficiently to cause pain or serious symptoms, and have come to the conclusion that unless there are other indications for their removal they should be left in the abdomen.

It is seldom that we have the opportunity to see the tubes during the first stages of salpingitis, for, as a rule, when we operate the chronic state has been reached. In salpingitis, like endometritis, all of the tissues take part in the acute stage; the whole organ is enlarged and greatly congested, the swelling closing or filling up the lumen, and at first all of the tissues are softened. At the fimbriæ, if not over the whole surface, peritoneal exudation has taken place and glued the organ to the ovary or any organ that it has come in contact with. If we operate during the acute stage of the first attack of peritonitis, the adhesions are easily broken down and separated from the enlarged soft and friable tubes, apparently saturated with the serous exudations. The mucous membrane is swollen, so that the lumen is occluded or filled with muco-purulent secretions varying in character with the degree or nature of the disease. In septic cases of an active or virulent type the tube and other tissues may be bathed in pus and very few adhesions formed: the disease is too powerful to be covered up or shut

in by adhesive exudates, the latter as soon as secreted being converted into septic fluid. Such cases usually prove fatal within six days. In the less virulent cases the swollen tube rolls backward behind the broad ligament, covering the ovary and becoming adherent to the posterior surface of the broad ligament, the floor of the pelvis, the rectum, etc. Sometimes the end of the tube is adherent to the side of the pelvis, frequently low down in Douglas' pouch, or the posterior surface of the uterus, or even to the other tube. In rare instances the tube is found twisted over forward and adherent to the bladder. Usually the left tube and ovary fill up most of the posterior and lower part of the pelvis, while the right stands up and is attached to the omentum and small intestines. This is probably due to the fact that the left tube is usually the first affected, and is most frequently found prolapsed independently of any active disease. When the acute becomes the subacute stage the swelling subsides and the adhesions contract, completely closing the fimbriated extremity and fixing the tube and ovary to the walls of the pelvis or other organs. If the uterine end of the tube remains open, the mucous secretions may drain away and leave the tube quiet, and in time give the patient comparatively slight trouble. But, as a rule, a chronic salpingitis takes the place of the acute stage, for the lumen affords very imperfect drainage; and menstruation, or rather the increase in size of the vessels of the pelvis which precedes menstruation, begins a week or ten days before the flow, causing an aching pain. When the patient stands up she has a dragging sensation, due to the weakened blood-vessels filling and causing pressure, or to the uterus dragging on the sensitive ligament. If the associated uterine disease has passed off and menstruation takes place normally, the flow of blood relieves the pain in the diseased tube and imprisoned ovary, and for a time the patient may be better; but if it is active and the flow is scant, the congestion remains, and the pain in the tube is aggravated and lasts for several days. It may subside for a few days, but soon the process begins again. The chronic catarrh of the tubes gradually causes a thickening and induration of the mucous membrane, and in time, by pressure, infiltration, and degeneration, affects all the tissues of the tube and increases its size from that of a lead-pencil to that of the thumb or of a much larger body, usually being club-shaped. Or the secretions may be retained and greatly distend the tube, or be converted into pus and form an abscess. The retained fluid may be thin and watery and light-colored, or it may be muco-purulent and gluey in appearance, or it may mix with blood or have a greenish tinge. The diseased tube may be constricted in places or convoluted: a part of the tube may be hard and small, and the rest distended and thin. The ends may be adherent, and the remainder of the tube free and distended. In hydrosalpinx the tubes may be enormously distended to hold several

ounces, and even a pint or more, of fluid. (See Fig. 311.) Hydrosal-
pinx[1] is probably only a late stage of catarrhal salpingitis. The tubes

FIG. 311.

Hydrosalpinx (exact drawing of specimen).

may be shortened and hardened and atrophied, as in Fig. 312, the
ovaries being cystic and atrophied.

Cystic degeneration of the ovaries in chronic cases of salpingitis seems
to be the rule, as shown in Figs. 313 and 314. Whether the cysts are

FIG. 312.

Hydrosalpinx, with Atrophied Ovaries.

the products of abnormal ovulation or not, I do not know. They may
burst and cause a local peritonitis, and greatly add to the pain and dis-
comfort of the patient. I think that the contact of the fluid of these

[1] For further discussion of hydrosalpinx, see p. 903.

cysts with the diseased contents of the tubes is what often causes
abscesses to form in the ovaries and tissues about the ends of the
tubes.

FIG. 313.

Atrophied and Contracted Tubes caused by Salpingitis.

Fig. 315 shows a specimen after the escape of several ounces of pus
found in the tissues of the ovary and end of the tube.

FIG. 314.
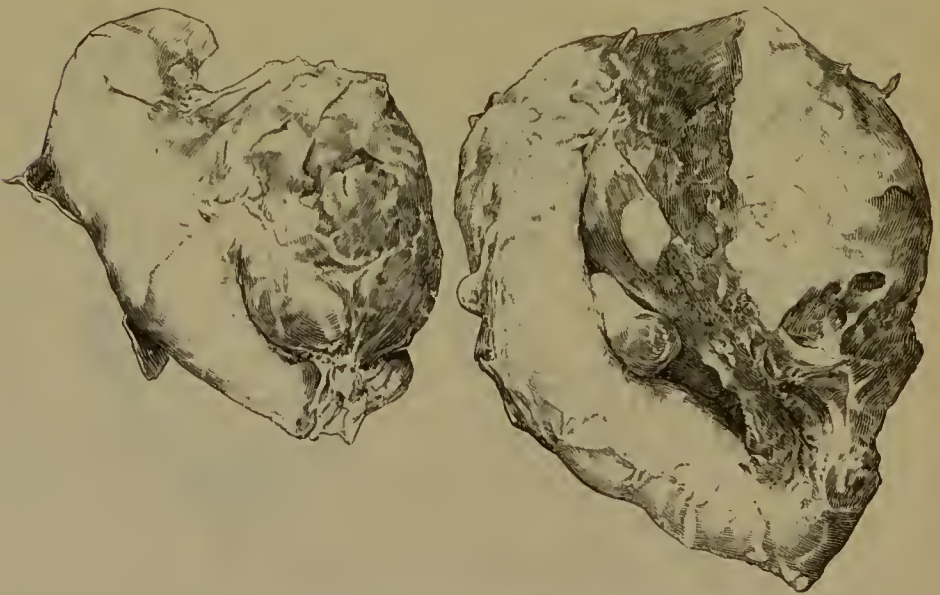
Chronic Salpingitis and Cystic Degeneration of the Ovaries.

Fig. 316 shows characteristic specimens of tuberculous disease affect-
ing the tubes and ovaries. The tissues are infiltrated with a cheesy
matter and covered by soft, friable peritoneal adhesions.

Fig. 315.
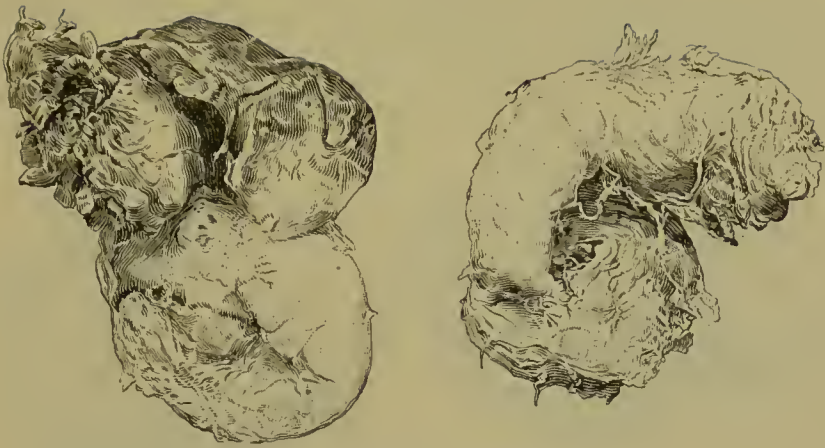
Chronic Salpingitis, with Abscess of the Ovary.

Tuberculous Salpingitis.—Tuberculosis of the tube was formerly included among neoplasms, but is now properly regarded as a specific form of inflammation. Primary tuberculous disease of the tubes was formerly regarded as very rare, but recent observations have shown that it is more common than was supposed. The characteristic bacillus has always been found in true cases. A distinction must always be made between caseous tuberculous nodules and purulent collections that have undergone caseation. Doubtless the latter condition might be mistaken for primary specific inflammation of the tubes when evidences of general tuberculosis were absent. Winckel states that the tubes alone are affected in nearly 50 per cent. of cases of tuberculous disease of the genital tract, the distal ends being most frequently affected. There is a wide difference of opinion as to its relative frequency, the writer quoted having found it in more than 1 per cent. of his autopsies (in 5 out of 575 subjects). Acute tuberculosis of the tubes has rarely been noted; Wernich's case, in which the lungs were secondarily affected, is almost unique. Chronic tuberculous salpingitis is the form usually encountered, the ovaries being singularly free from the disease. In many cases it is evident that there is direct extension from the uterine mucous membrane. The appearance of a tuberculous tube is not especially characteristic; it presents the ordinary enlargement and distortion seen in chronic salpingitis, being commonly prolapsed and buried in adhesions. It is greatly thickened, and has an irregular, nodular shape, which is due not only to dilatation and sacculation, but also to the development of tubercles in its wall. The lumen may or may not be patent. On section the tube appears dilated and its walls are thickened, not alone from hypertrophy, as in non-specific chronic salpingitis, but from the deposit of caseous material; masses of the latter also fill its interior. Microscopical sections show a caseous

layer replacing the normal epithelium, and below this granulation tissue. The unaffected muscular layer is hypertrophied, and may contain tuberculous nodules in which the specific bacilli are seen.

FIG. 316.
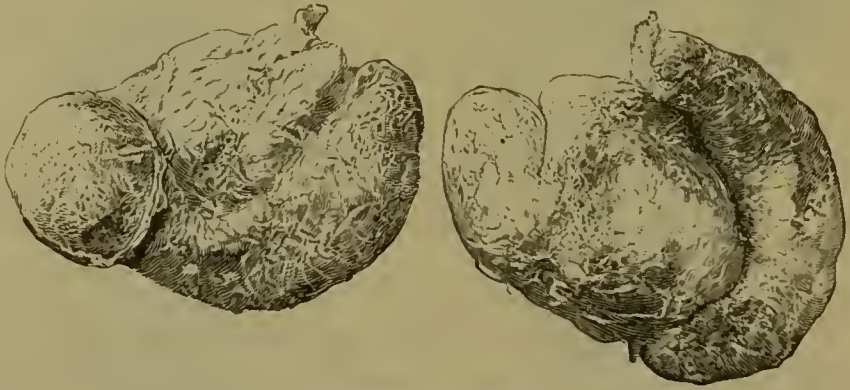
Tuberculous Salpingitis.

FIG. 317.

Tuberculosis of the Tubes (Winckel).

The clinical diagnosis of this condition is seldom possible, except in clearly-marked cases of general tuberculosis, in which progressive enlargement of the tubes can be detected by palpation. The presence of several nodules on an enlarged tube might suggest specific disease, especially where the history and physical examination left little doubt as to the existence of general infection. It has been suggested that the finding of tubercle bacilli in discharges from the uterus would be a valuable aid to exact diagnosis. It is unnecessary to say that primary tuberculosis of the tubes is to be determined by the pathologist rather than by the surgeon. Since it rarely happens that this form of salpingitis is discovered before the abdomen is opened, there are no special indications for treatment. As the absence of general infection cannot be positively determined even in cases that are apparently primary, the conditions that prevail are somewhat similar to those in malignant disease of the appendages, the prognosis as regards permanent benefit being doubtful. (See Tuberculous Oöphoritis.)

The adhesions about the diseased tube vary greatly in their nature and extent. Frequent and prolonged attacks of peritonitis cause very dense and firm adhesions, and in old cases the adhesions may be so great as completely to obscure, both to the touch and sight, all signs of the tubes. The surface of the adhesions may be as smooth and as perfect as the peritoneum covering a healthy organ, without a seam or break to distinguish the new formation from that covering the normal organs ; and it is necessary to tear or dissect through a point to make a beginning—to tear up the imbedded tubes and ovaries. We may come across a very tough and indurated point of adhesion marking the place where an abscess had perforated into the connective tissue in the floor of the pelvis ; and when we operate on a case where the old abscess has previously communicated with the intestine, there is great danger of tearing the gut in separating the adhesion. Or we may tear into the connective tissue on the floor of the pelvis and injure a ureter. Sometimes we may find the cellular tissue between the layers of the broad ligament œdematous from infiltration, making the pedicle thick and soft, but this is about all we ever see of the so-called chronic pelvic cellulitis so warmly advocated by Dr. Emmet and some of his followers.

When there is pus in the tubes, the disease is termed pyosalpinx. The pus may be slight in quantity, with the walls of the tube thickened and in a state of more or less fatty degeneration, the lumen being occluded always at the fimbriated, and frequently at both, ends. It may be thin and the quantity large, the walls may be thinned out, the epithelium denuded, and the muscular coats atrophied. In *hydrosalpinx* the amount of fluid is relatively large, the walls very thin, sometimes almost transparent, and marked over the surface by numerous delicate blood-vessels. The fluid is

FIG. 318.

Pyosalpinx.

clear or sometimes tinged with blood. In *hæmatosalpinx* the blood is usually coagulated and the walls of the tubes thickened, but sometimes it is tarry and composed largely of pigment ; this pigment may be tarry and closely resemble retained menstrual blood found in the uterus where there is complete occlusion of the vagina, indicating that it is the product of repeated hemorrhages and comes from the walls of the tubes. Similar pigmentary fluid is found in old cysts of the ovaries. I believe that in many of the cases of hæmatosalpinx where only one side was affected and the amount of clotted blood was large, with the walls of the tube much thickened, the cause was tubal pregnancy. I am inclined to think that some of the cases of pelvic abscesses had their origin in tubal pregnancy, which we now know is not very rare.
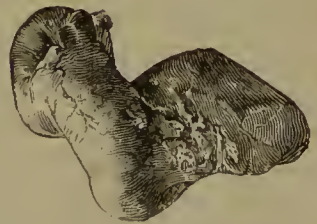
The pus in pyosalpinx, and likewise in pelvic abscess, varies considerably in its character, or, at any rate, in its power to infect healthy tissues. When it is mixed with mucus or with serous exudation, and is free from odor or gas indicating active decomposition, it is not likely to be followed by septic peritonitis if it escapes during the operation; but when we break into an abscess containing gas, we rarely save our patients, although there may be no direct communication with the intestines. Such pus is found in recent puerperal septic salpingitis or in patients having almost constant general symptoms of septic poisoning, and if possible it should be evacuated without opening the peritoneal cavity.

PREVENTION.—When the etiology of any disease is well understood its prevention is plainly indicated. It is important that the general health and strength of girls while developing into women should be kept up, so that the generative organs shall fully develop and resist catarrhal disease. When there are symptoms of leucorrhœa and dysmenorrhœa, the disease should be treated early and before it has reached the Fallopian tubes. If the endometrium is affected, the uterine canal should be kept patulous, so as to secure perfect drainage, and thus lessen the chance of the disease entering the Fallopian tubes. The grave nature and the almost certain consequences of venereal affections should be explained to and impressed upon all young persons, and definite instructions should be given, especially to all male patients suffering with gonorrhœa, to avoid intercourse until complete cure is effected. No doubt in many cases the disease which is supposed to be due to septic poisons after labor is caused by gonorrhœa contracted from husbands who have been led astray while deprived of their usual indulgence during the confinement of their wives.

The serious consequences of a salpingitis caused even by a slight septic endometritis forcibly show the vast importance of cleanliness and antiseptics or of any other means that may lessen the chance of puerperal septicæmia. We know that subinvolution rarely exists without the development, sooner or later, of endometritis, and, instead of taking for granted that when a woman has passed the ninth day after labor the responsibility of her physician is at an end, every lying-in woman should be examined locally before she is allowed to go about her usual duties. It is safer to keep the woman under observation until the uterus is normal in size, position, and condition. If treatment is needed, it is better to begin it not later than at the end of the second week after labor. A few stimulating applications of boroglyceride, glycerin, and alum, made twice a week during the third, fourth, fifth, and sixth weeks after labor, will prevent subinvolution, retroversion, endometritis, and salpingitis in a delicate or weak woman who without

such treatment would, it is quite certain, be affected with one or more of these serious troubles.

When we have an endometritis, it is especially important that we should secure perfect drainage from the uterus. After abortions the greatest care should be taken to prevent septic infection and ensure removal of all the placenta and membranes. Especial care should be taken to secure perfect involution and drainage of the uterus, for after labor Nature generally accomplishes this result without help; but this is not so in the case of abortions. Labor is normal; but abortions are abnormal, and almost certain to be followed by disease.

Of course doctors should keep their hands and instruments as clean as practicable; but no sound or instrument should be brought in contact with the uterus unless the vagina has been washed out with an antiseptic solution, for even a clean sound can carry infection into the uterus from the vagina. All septic or sloughing tumors or tissues should be soaked in antiseptic fluids by douche for several hours previously to operation for removal, whereby wounding of the uterus and vagina is certain to occur, so as to avoid the risk of sepsis reaching the blood-vessels or the Fallopian tubes.

Uterine tents and tampons should be totally abandoned, and the tampon in any form should be rarely if ever used.

TREATMENT.—The effects of salpingitis are very variable. Much depends upon the nature of the disease or poison that causes it. Salpingitis due to catarrhal disease or to mild forms of sepsis may exist for years before it is recognized or gives the patient sufficient trouble to cause her to seek the relief afforded by a local examination; and a very large proportion of cases are not diagnosed, the symptoms being attributed to displacements, cellulitis, etc.

Then it must not be forgotten that the effect of a given local disease is not the same in different individuals; that is, mild salpingitis in a healthy individual with an even and well-balanced nervous system will not cause the same digestive and other functional disturbances which it would cause in a delicate, sensitive woman with an ill-balanced and hyperæsthetic nervous system.

Very often the local disease is subacute, and remains more or less latent in a limited peritoneal sac of adhesions. Besides, occupation or habits of life greatly modify the effects of a disease. Among the well-to-do a woman with a chronic salpingitis, by leading a very quiet life and avoiding standing or exertion during periods of congestion, may get on without great suffering, and deliberately decide not to resort to an operation for a radical cure. But a poor working-girl, who stands behind a counter eight or ten hours a day, must have help or she will break down, and the woman who does washing and takes care of her children soon succumbs.

There are women who have an acute attack of the disease accompanied by local peritonitis, and keep in bed till it subsides, who then enjoy comparative comfort for weeks or months, or even years, before another attack renders them helpless, and who again get up and attend to their duties. But follow these cases, and sooner or later you will see many of them end with general peritonitis and death, or with a fistulous opening in the rectum or vagina or in some other part of the pelvis. It is surprising what some women can endure. Only recently I operated on a young woman with the following history: About three years ago she came to New York and entered the Bellevue Training School for Nurses. At the end of a year she was sent away, against her wishes, on account of physical disability to do the work assigned her. On examination I found unmistakable objective symptoms of salpingitis. On the right side was an indurated mass in the broad ligament. I advised operation for its removal as the only means of cure, and predicted that the mass, if not removed, would sooner or later break down. She refused to submit to the operation, and went to one of our general hospitals, but, not being able to endure the treatment ordered for her, left. Last summer, while at home for a rest, she had severe local pains and fever. The case was diagnosed as typhoid fever, for which she was treated many weeks. In the fall she returned to New York, and, although still sick, she sought occupation as a nurse. After filling this position for six months, she came to me and said she could endure her sufferings no longer. She gave me a clear history of the bursting of a pelvic abscess nearly a year before and of frequent attacks ever since of purulent diarrhœa. On examination I found a hard, rounded mass on the right side attached to the uterus and simulating a fibroid tumor the size of the fist. My diagnosis was a chronic abscess around the tube and ovary, opening high up in the rectum. She was put to bed, and on examination of the stools the diagnosis was confirmed. The opening in the rectum could not be reached, and, as the tumor did not present fairly in Douglas' pouch, and was drawn by adhesions high up into the pelvis, I decided to open the abdomen, verify my diagnosis, and at the same time find out whether a trocar could be safely passed into the old abscess by the vagina; for I knew that to open the abscess within the peritoneum and leave the hole in the rectum, or to try to close it, would be almost certain to kill her. When the abdomen was opened the sac of the abscess was covered with adherent intestines and the whole pelvis was a mass of adherent organs. I soon separated them sufficiently to determine beyond question that the abscess communicated with the rectum, and that well up in Douglas' pouch I could puncture and drain by the vagina. This was done, and about four ounces of fetid, dirty pus were evacuated. The cavity was washed out, the opening was dilated, and a

drainage-tube was introduced. If this woman had had money enough to live on, she would never have submitted to the operation. I have now three other patients under my care in whom the symptoms of an abscess opening and discharging at intervals into the rectum are precisely the same, but they will not submit to an operation.

In severe cases during the acute stage complete rest in bed is the proper treatment; anodynes and counter-irritants may be used. When the active symptoms subside, I apply thin pledgets of cotton, saturated with a mixture of boroglyceride one part and pure glycerin fifteen parts, to the cervix and vagina; these are left in place twenty-four hours, then removed and a douche of hot water given. On the third day another pledget is put in, and this is kept in place for a week or two. Later a solution of one part boroglyceride, one of alum, and fourteen of pure glycerin is used to saturate the cotton in place of the first mixture. Some patients will not tolerate even this mild treatment; when it is borne, after a week or so the solution softens the products of inflammation and renders the uterus more movable, and enables one to make a more accurate diagnosis. It improves the circulation, and often gives, for the time, more or less complete relief to all the local symptoms. With this simple local treatment close attention should be paid to the general health and to the condition of digestion. The bowels especially should be carefully regulated, for impacted fecal matter in the lower end of the descending colon or rectum may materially add to the pain and aggravate the disease by pressing directly on the left broad ligament.

In patients suffering from dysmenorrhœa it will be safe to sound the uterus if we succeed in getting it movable, so that it can be pulled pretty well down with the tenaculum without causing much pain, and the canal, if it is contracted and hyperæsthetic, should be gently dilated, so as to secure good drainage and proper applications to the mucous lining. If excessive hemorrhage has existed, and if it is not corrected by tincture of cannabis indica, twenty drops given twice a day, it will be safe, if the uterus can be made movable by the use of the medicated pledgets, to curette it for the removal of granulations. I always adopt this treatment preparatory to operation, except where the diagnosis is plain and indicates immediate action to prevent rupture of a painful cyst or to prevent septic poison and death after rupture. In these cases I resort at once to the operation for removal, unless I feel assured that the contents of the pelvic abscess are virulently poisonous. Then, if practicable, I endeavor first to draw off the pus by way of the vagina. If it is necessary to determine whether this can be safely done, I open the abdomen, as I have done for several years past, and determine just where to make my puncture in the vagina. If the tumor happens to be adherent to the anterior abdominal wall, as I have found

in two cases, the one near Poupart's ligament, the other above the crest of the ilium to one side, I open in the groin. Usually I have closed the exploratory incision in the abdominal wall before making an opening in the vagina to evacuate and drain off the pus.

In opening abscesses by the vagina and draining them, I endeavor to find a presenting fluctuating point in Douglas' pouch as near as possible posterior to the os uteri. If no such point can be plainly made out, I prefer, rather than run the risk of puncturing at any other point in the vagina, to make an exploratory incision into the abdomen in the median line, and then determine the safest point to puncture. By this means we can avoid puncturing an intestine, the ureters, or a large pelvic blood-vessel. If we puncture to either side of the uterus, we must go through the whole thickness of the broad ligament, and run great risk of cutting a ureter or large vessel. If we puncture in front of the uterus, we are almost certain to go through the bladder. Having determined that it is best to puncture and drain by the vagina, with a long curved trocar I puncture the abscess; then the canula is withdrawn and the pus evacuated, and the cavity repeatedly washed out with 1 : 5000 sublimate solution. With the canula still in place I turn the patient on her side in Sims' position and introduce Sims' speculum in the vagina; then I pass through the canula a small probe without a handle, and slip it out over the probe, keeping the probe in as a guide. With a steel uterine dilator I dilate the opening, so that I can pass my finger into the abscess. By means of a pair of slender forceps I carry into the abscess a large-sized drainage-tube of soft rubber; in this way I avoid the use of a knife and the risk of cutting a blood-vessel or the ureter. To prevent the tube from slipping or being forced out as the cavity of the abscess contracts, I pass a silver suture through the posterior lip of the cervix and the wall of the drainage-tube, and tie the tube to the cervix with silver wire. The cavity is washed out with an antiseptic solution, as indicated by the discharge and temperature of the patient. As the discharge diminishes the large tube is replaced by a smaller one and the opening kept dilated until all drainage ceases.

I would not advise this treatment except in those cases where abdominal section is not allowed, or where there seems to be only one large cyst such as is sometimes found following a broken-down hæmatocele pointing in Douglas' pouch, or where we are sure to find actively septic pus. In most cases the abscess or distended tube is too small to be reached safely in this way. If, after opening the abdomen and finding a large pus-cavity, I wish to make a counter-opening through the vagina, I make a small opening with a trocar or pointed forceps, and then dilate it with dilators. In the case of a large pelvic abscess pointing toward Poupart's ligament I open by an incision in the groin,

and would not enter the peritoneal cavity above the abscess except to secure complete removal or to get perfect drainage or make sure just where to open.

When diseased tubes are plainly made out, and the patient is bed-ridden or suffers to such an extent that after being clearly informed as to the effect and danger of the operation she consents to its performance, then we consider complete removal of both tubes and ovaries, if both sides are affected, to be justifiable. By softening the indurated tissue and improving the circulation of the pelvis we can help, but not cure. By atrophy and absorption Nature may cure, but chronic invalidism usually comes on before the cure has been effected, or instead of the usual attack of local peritonitis the bursting of a distended tube may cause general peritonitis and death. The early removal of a diseased tube could have prevented many cases of so-called idiopathic peritonitis. Even after the peritonitis set in the patient might have been saved by a bold surgeon.

After having resorted to the preparatory treatment with glycerin-and-alum pledgets as described, and having decided that an operation is proper, I have the patient's bowels well emptied. I put her on pancreatized milk diet, with very little other plain food, for three or four days previously to the operation. The object is to remove all impacted fecal matter and to lessen the amount of gas in the intestines, which, by crowding around the pelvic organs and out through the incision in the abdominal wall, may be very troublesome. Thus, there will be little or no gas in the intestines, which will be found to be like slippery ribbons. On the day of the operation the bowels should be well moved, but not excessively.

In surgical practice I would place cleanliness first, drainage second, rest third, and antiseptics fourth. If we could be perfect in cleanliness —for prevention is better than cure—antiseptics would be useless. Some of us are willing to be considered fallible, and for this reason use antiseptics. Before Lister plainly showed the necessity of cleanliness and the value of antiseptics, few surgeons knew how important cleanliness was to success in surgery. Who, prior to the teachings of that eminent surgeon, spent hours in cleaning instruments and sponges, and placed over wounds a thick layer of absorbent cotton-wool? Cotton-wool affords the best protection against the passage of germs and their spores; and he who uses it for dressing wounds carries out the principles taught by Lister.

Before operating my patient is thoroughly bathed and clean clothing for her body and bed ordered. The abdomen is shaved down to the pubic bone and well washed with soap and water and alcohol, and, before the skin is cut, well washed with a solution of 1 : 3000 acid solution of mercuric bichloride. All the instruments are kept in solutions

of 1 : 20 No. 1 Calvert's carbolic acid, and sponges in a 1 : 5000 acid solution of mercuric bichloride. Two assistants only are needed—the one to give ether, and the other to stand opposite the operator and apply the sponge—for of course the danger of infection is in proportion to the number of persons who aid the surgeon. Thorough ablution and the use of the solution of bichloride are enjoined on all assistants.

The patient being etherized, the bladder is emptied and the abdominal incision is made just above the pubes. The length of the incision in the skin is from two and a half to three inches, according to the amount of fat in the abdominal walls, the opening in the peritoneum being only large enough to allow the free use of the index and middle finger at the same time. This opening is rarely made larger, unless the distended tube or ovary is of such a size as to make it necessary to do so to extract it. A larger opening adds to the risk of septic poisoning and of ventral hernia. When ovarian and other large tumors are removed the abdominal walls are relaxed, there is less tension on the sutures, and perfect union is more readily secured than in those cases in which the intra-abdominal pressure is normal.

When the subperitoneal fat is reached it may be troublesome to get through it, for there is no distended tumor directly underneath it to keep away the intestines and hold the many layers of the peritoneum together. Where gas is in the intestines this difficulty is increased. The incision through the peritoneum is made by pinching it up with two pointed forceps and cutting through it between them. When the omentum is free from adhesions it can be pushed up as one would push up the end of an apron. When it is adherent, as it often is, to the broad ligament and anterior wall or top of the uterus, it cannot easily be separated by pulling it from below upward, but, by passing the index and middle finger well to one side and getting them underneath, and then separating the adhesions, many formidable-looking cases can be easily managed. As the adhesions are separated they should be lifted through the opening and any bleeding points tied. The principal vessels in these adhesions come from those of the omentum, and not from the pelvic organ; therefore the end of the omentum is the part to be tied. If the adhesions are strong and vascular, as they may be in those cases in which there have been repeated attacks of local peritonitis, the omental adhesion can be tied off—tied first as low as possible, and then a little higher—and cut between the ligatures. By pulling the sides of the abdominal opening laterally with retractors we can do this without enlarging the opening in most cases. In handling and tying the omentum care should be taken not to split or tear it, for it will invariably bleed in the angle of the tear, and may be very troublesome. Where the uterus is retroverted the removal of the omentum,

as a rule, frees the anterior part of the fundus and the anterior face of
the broad ligaments; often the small intestines will have to be sepa-
rated, but they are generally not firmly adherent. The next step is to
elevate the uterus by placing the fingers behind it. The back of the
fundus may be adherent, but, as a rule, it is free and is held back by
the twisted and rolled-up state of the broad ligament. The ovary will
be found folded under the tube and broad ligament, and to get it up
we must either go down through the broad ligament or unroll it. I
have seen the former done several times, with the result of adding
greatly to the length of the operation, and of necessitating tearing
or tying off the outer attachments of the broad ligament before the
tube can be detached and tied off with the ovary. Now, by putting
both fingers directly behind the uterus and running them laterally,
guided by the Fallopian tubes as they are given off from the uterus,
and gradually separating the adhesions and unrolling till we get under
the ovary, the tube and ovary can be easily freed in the worst cases.
Where the adhesions are very firm, an assistant's finger in the vagina
may be a useful guide, for in scratching loose the adhesions the ureter
may be lifted up and the sigmoid flexure or rectum may be torn up, for
it may be adherent to the tube or ovary on the left side. When both
sides are adherent it may be well to lift them up before tying either,
although in some cases where the bleeding is free it may be better to
tie the one first lifted up. In many cases I have found the tissues so
degenerated that my ligature cut through, and I was compelled to en-
large the abdominal opening and tie the arteries after picking them up
with forceps. Where the tissues are frail and the ligatures are inclined
to cut easily, it is safer to remove the former and tie the arteries sep-
arately, of which two or three will usually be found. Where the
broad ligament is much enlarged we may tie with two ligatures—the
double including the ovarian ligament and the tube within half an
inch of the fundus, the single tying off the outer end of the broad
ligament. The pampiniform plexus may give trouble; I have seen
it so degenerated as to fall to pieces while being tied. I use firmly-
twisted Chinese silk, and prefer to pass a double thread with a needle
somewhat like an aneurism-needle, with a sharper point and longer
handle than those generally found in the shops.

In tying, except in cases where one double ligature will suffice, I
do not use Mr. Tait's Staffordshire knot, but cross and interlock the
two loops of all double ligatures, and, so far, have never had a
ligature slip after the operation. After tying, before cutting off the
tube and ovary, I catch the tissue with pressure-forceps close to the
ligature, so that I can cut off the ligatures and not be tempted to use
them to lift up the pedicle when once tied. Besides enabling me to
keep the pedicle in sight, these forceps act as guides in cutting away

the tube and ovary. Often the ovarian ligament is so short that it is not easy to get a satisfactory stump left and cut off all the ovary. With a Paquelin cautery I touch any suppurating end of a tube in the stump or ovarian tissue that may be left on it after tying. The tubes and ovaries of both sides should be removed if there be the least sign of salpingitis, but in several cases I have found only the left side affected, the right tube and ovary being free from even a single adhesion; and I removed only those of the diseased side.

The cavity should be thoroughly dried with sponges, and time given for hemorrhage to make itself manifest before the wound is closed. Where there are extensive adhesions, or any pus-cavity has been disturbed, the abdomen should be flooded and washed out with water at 110° Fahr. For this purpose I prefer a gallon fountain-syringe with a large tube which is carried well to the bottom of the pelvis, so as to wash up clots, etc.; it does this much better than does pouring in water from a pitcher. In all such cases as require washing out a drainage-tube should be inserted. I prefer a small-sized tube of glass with some small holes in the sides, and open ends, and use a catheter attached to an ordinary syringe for emptying the tube when needed. If there is no discharge, I remove the large tube in twenty-four hours and slip a smaller glass tube in its place, when the opening soon fills up from the bottom. In introducing the sutures in the abdominal wall, I am careful to secure not only perfect coaptation of the peritoneal coats, but also of the deep and thick abdominal fascia, for if good union of the latter is secured the risk of ventral hernia is much lessened. It is this tissue, and not the muscles, which are longitudinal, that gives strength to the abdominal wall in the median line. For forty-eight hours nothing is allowed to be taken except teaspoonful doses of hot water or weak tea. Enough morphine is used to prevent great pain and restlessness, but as a rule it is not needed. An enema is usually given on the third day to move the bowels, and sutures are removed on the sixth day. If indicated by the pulse or by great thirst, nutritive enemata are given every four hours. Either medium silk or silver wire is used in sutures for the abdominal walls. If the abdominal walls are thick from adipose tissue, the peritoneum, as a rule, will be found tense, and to close it properly will require more than usual care. In such a case, after passing from three to six silk sutures through the skin, fascia, and peritoneum, the peritoneum should be carefully closed with catgut sutures, and the fascia or conjoined tendon of the transverse muscles be separately closed in the same way. Then the first silk sutures should be closed, leaving room between them, in two or more spaces, for short drainage-tubes, placed upright so as to drain the adipose tissue between the fascia and the skin. Or, if the walls are closed by silk sutures in the usual way, the skin, a little to the side of

the cut, should be punctured, so as to give vent to the grease that is certain to escape from the more or less bruised adipose tissue. I have seen mural abscesses caused by this free fat, which might enter the peritoneum and augment the trouble. After sewing up and cleaning the wound it should be freely sprinkled with iodoform and covered with a layer of absorbent cotton that has been squeezed out in 1 : 5000 acid solution of mercuric bichloride, and over this with several layers more of dry absorbent cotton, so that the whole abdomen will be evenly compressed when the adhesive straps and band are put on. Over the cotton a folded towel and mackintosh are placed, and firmly compressed by adhesive straps and a bandage. Except where a drainage-tube is inserted, this dressing can remain until the sixth day, unless oozing appears through it or a rise of temperature takes place, indicating septic poisoning, when the wound should be examined. In cases with extensive adhesions or in pyosalpinx, especially where the tissues are infiltrated, we must expect during the first two or three days a moderate rise of temperature, caused by the small amount of septic material left in the pelvis; but this is readily absorbed, and the local peritonitis caused by it soon subsides.

When the patient fails to rally well, and has a temperature at or below the normal, or where all symptoms are favorable and the temperature is low until the afternoon of the third or until the fourth day, the temperature then making a steady rise, there is, as a rule, a fatal case of septicæmia to deal with, death usually occurring within two or three days. Sometimes a case begins as a local peritonitis, which gradually spreads to a general peritonitis, with vomiting and death. I think the proper name for such a case is septicæmia.

Since I have learned how to wash the abdominal cavity clean during an operation, many formidable cases have recovered without any serious symptoms, often with a normal pulse and temperature. In a paper read before the Medical Society of the State of New York, Feb. 2, 1887, I not only advocated the use of hot water for washing out the peritoneal cavity and as an efficient hæmostatic for oozing points too numerous and small to tie, but also maintained *that in a prolonged operation, and immediately after it, free irrigation of the peritoneal cavity with water at 110° to 115° is a powerful and efficient agent in lessening, if not entirely preventing, the effects of shock.* The water should have a temperature of 110° to 120°, or it may cause shock. I have now used it frequently for two years past, and it certainly is a powerful stimulant, especially if forced well up near the diaphragm. When used early it will prevent the shock, but when shock has lasted some time it is doubtful whether it can be used with success, for the opening of the peritoneum adds to the danger. Sometimes it is efficient when injected through the drainage-tube, but I would not advise this many hours after opera-

tion, for shock that does not soon show itself is apt to be due to hemorrhage caused by the slipping of a ligature.

In that paper I also advocated the use of enemata and purgatives after laparotomy, for the relief of the tympanites and vomiting supposed to be due to peritonitis, instead of the free use of opium, at that time almost universally resorted to. Previous to this purgatives had been used in septic peritonitis, and Tait had found them beneficial after laparotomy, but the theory was that they carried off the septic poison. I took the ground that it is probable that in many cases the persistent and exhausting vomiting may be the direct result of obstruction caused by peritoneal exudations twisting or constricting the intestines.

For a long time I have seriously doubted the existence of septic peritonitis in the beginning of some cases in which the vomiting preceded the rise of temperature and other symptoms of sepsis. Death in these cases I believe to be due to intestinal obstruction. The obstruction and the vomiting overcome the reparative process. A septic condition ensues, with fatal results, before the obstruction has reached the stage of slough. At any rate, I have found it best always to move the bowels, whenever indicated by tympanites or vomiting, even during the first twenty-four hours after operation.

Vomiting resulting from ether is likely to be preceded by marked nausea, and comes on immediately or within a few hours after the operation, and is of unusual violence; while that from obstruction is passive and somewhat like eructations. The quantity vomited is large, is at first brownish-colored, and soon is attended with extreme exhaustion and marked tympanites.

The opium treatment for peritonitis, so ably advocated by the late Dr. A. Clark, may be the best plan for limiting the disease at its commencement, and the resort to it at this time may account for its success in certain cases; but I am certain that it is not best suited for cases of septic peritonitis following laparotomy. When the pain is very intense or there is great restlessness, I may use just sufficient opium or morphine to give a rest, but rarely repeat the medicine more than once or twice. As soon as tympanites or eructive vomiting begins, I move the bowels by turpentine enemata, or, if I fail to get a full movement, I give a Seidlitz powder and Epsom salts or an ox-gall enema.

For some years past I have been in the habit of keeping up my patient's strength by stimulating and nutritive enemata, given every four hours after laparotomy, when indicated by thirst or the pulse, so as to avoid disturbing the stomach for at least thirty-six or forty-eight hours. The beneficial results of this treatment were soon evident, and it occurred to me last year that large hot saline enemata of the sarcopeptones or beef-tea given *during the operation* might through rapid absorption prevent shock by performing the functions of the blood

lost by hemorrhage. In October, 1887, I reported to the New York
Obstetrical Society two cases in which I had used them for this pur-
pose. One of these was a case of hysterectomy for a large vascular
fibroma. Several large venous sinuses were torn in lifting out the
tumor; and as this had a double source of blood-supply—one from
the uterus, the other from enormously distended vessels passing into
the tumor from the omentum—at least three pints of blood were lost
before both pedicles could be secured. Immediately an eight-ounce
salt solution of beef-peptones was injected into the rectum while I was
operating, and four or more similar injections were given every twenty
minutes. All were retained. Although there were at first marked
symptoms of shock, the patient quickly rallied, and three hours later
all signs of it had disappeared. The enemata were repeated at longer
intervals, and the patient made a good recovery.

The hot saline injections were given not merely to stimulate reac-
tion or to nourish the patient, but to take the place of the blood which
was lost. It is surprising how absorbent the rectum is under such
conditions.

It is of importance to give the enemata when the blood has just
been lost, and to repeat them often enough to keep the rectum full
until the loss is made up.

The Results of Operations for Removal of the Uterine Appendages for Disease.

Up to January 1, 1888, I operated for the removal of the ap-
pendages 115 times, with 6 deaths. In the first 25 there were 3
deaths; in the second 25 there were 2 deaths; in the third 25 there
were no deaths; in the fourth 25 there were no deaths; and I had a
run of 61 consecutive operations without a death. It seems to me that
it is thus proved that this is not a very dangerous operation, as far as
loss of life is concerned.

Now as to the results on the health and life of the patient. There
is no reasonable doubt that pyosalpinx is the only means by which
real relief can be had in the great majority of cases, and that it act-
ually saves lives. The number of women who have died from an exten-
sion of local peritonitis due to it is much greater than is generally
known.

In hydrosalpinx the operation is not imperatively needed, but fre-
quently removal of the uterine appendages relieves the pain which it
produces. It is nearly always bilateral, and, as one tube only usually
lies low enough to be tapped by the vagina, this operation should be
discarded. In catarrhal inflammation, where the tubes are occluded,
disturbance to functions and fixation of the uterus by adhesions in the

broad ligament will in time necessitate removal of the appendages. Where there is no occlusion, except in rare cases of hydatids of the tubes, the operation should be resorted to only when there is disease of the ovaries or uterus. Hæmatosalpinx, uncomplicated by disease of the tubes or ovaries, may not, unless the hemorrhage is the result of disease, require removal.

If, in tubal pregnancy, rupture takes place, removal is the best treatment. If it is complicated by disease, hemorrhage, or inflammation, laparotomy is frequently the only means of saving life; and, if uncomplicated, the operation for removal is attended with little danger, and secures us against further complications.

The removal of the appendages for the purpose of stopping the menstrual function[1] is justifiable in many cases of fibromata of the uterus, for it will nearly always stop their further development. Not infrequently the severe pains supposed to be due to the fibroids are caused by pyosalpinx. Submucous fibromata are not always cured by removing the appendages if these are diseased or adherent, for occasionally in a case of this kind bleeding and increase in size will be manifested. I make it a rule to curette the lining membrane of the uterus prior to the operation.

I know of no uterine disease except fibromata, and perhaps endometritis, which justifies removal of the appendages when normal. Hemorrhage, when due to disease of the uterus, can be stopped by adequate curetting with a good steel instrument, although the little copper instrument so highly recommended will often fail to secure this result.

Dysmenorrhœa is due to uterine disease, and in almost all cases can be readily cured by either dilatation or divulsion; the healthy appendages should never be removed when the dysmenorrhœa is uncomplicated.

Where there is atrophy and degeneration of the uterus with perversion of all the functions, and where menstruation makes life miserable, removal of the appendages is justifiable should all other means have failed to give relief; but it is doubtful whether the characteristic cystic ovaries nearly always found in such cases can be called normal. Dilatation, stimulating local treatment, and proper attention to the general condition may make the patient strong and relatively healthy. When she is over thirty years of age and bedridden, the operation can do little harm, and certainly in some cases affords the only attainable relief.

In epilepsy or so-called hystero-epilepsy the operation may be temporarily beneficial, but in three out of four cases it is of no permanent service. In this disorder, unless I can detect signs of disease either of the ovaries or the tubes, I will not operate.

[1] See article on Battey's operation.

In mental diseases which seem to be connected with functional disturbance of the tubes and ovaries, I will not operate unless the touch indicates disease of the tubes or the ovaries, such as adhesions, decided enlargement, or fixation. In a given number of cases the operation is for a time followed by marked mental depression. Subinvolution of the uterus after labor and abortion is not infrequently associated with serious mental symptoms which can be relieved by restoring the uterus to a normal state. The fact that the generative functions are disturbed or abnormal does not imply that they are diseased.

About 10 per cent. of the patients operated upon continue to menstruate after removal of the appendages, and I know of two cases in which, after operation, menstruation ceased for a year and then came on and became regular. After close investigation I have been led to conclude that this occurs in those cases where the adhesions are great, especially where the inflammation contracts and shortens the ovarian ligament, and makes it difficult so to remove the ovary that more or less of it shall not remain in the stump, or where the adhesions are such that it is necessary to tear it into pieces to remove it, usually a small part being left on the floor of the pelvis or on the broad ligament. I do not know of an instance in which menstruation returned and remained regular where the ovaries and tubes, being entirely free from adhesions, were removed close to the uterus.

I suppose that if the tubes and ovaries were removed before puberty the character and nature of the woman would be greatly changed; but when removed at maturity they do not appear to have any marked effect on her appearance, character, or temperament.

Ventral hernia following laparotomy for removal of the appendages is by no means rare, as I pointed out in a paper on this subject.[1] Most operators overlook the fact that the deep fascia which divides so as to form the sheath of the recti muscles, and which unites in the median line to form the linea alba, is in reality the tendon of the transverse abdominal muscles—that it is this fascia, and not the recti muscles, which gives the abdominal walls their transverse strength. Unless special care is taken to secure exact apposition of the edges of this divided fascia the muscles or the adipose tissue will intervene, and hernia will result, especially if a large-sized drainage-tube has been used.

In cases of diseased tubes the intra-abdominal pressure tends to separate the edges of the fascia, especially if the woman is fat and if the liability to hernia is much greater than in ordinary laparotomy for cystoma. It is the custom among operators, following the advice of Tait, to have closely-fitting trusses worn for a year after laparotomy. These trusses will often prevent the early appearance of hernia; but

[1] "Ventral Hernia caused by Laparotomy," *Amer. Journ. Obst.*, vol. xix., Jan., 1887.

if the fascia has not been properly closed, the old scar begins to yield and a troublesome hernia to form.

Where removal of the ovaries is complete, and all of the tubes to within half an inch of the uterus have been cut away, bimanual examination of the patients generally reveals after a few months no sign of the old "thickening in the broad ligament;" the so-called cellulitis is gone, the uterus is movable, and gradually becomes contracted. It is often found retroverted. Unless menstruation and an old endometritis continue, there will be no symptoms attributable to retroversion. As in the case of other women, we may find after the menopause more or less contraction and hyperæsthesia about the ostium vaginæ, which is probably due to atrophy and degeneration.

Many patients, especially those who were operated upon for chronic salpingitis, and in whom for years abnormal congestion and dilatation of the blood-vessels of the pelvis had been manifested, complain of pelvic pains and dragging sensations on standing, and at times seem to have a renewal of the old trouble. These attacks will be found to occur at intervals, and are probably due to an effort of nature to keep up the habit of menstruation. If the ovaries have been partially left, menstruation is almost certain to continue, and it may, if endometritis still exist, cause dysmenorrhœa and other painful symptoms. For this reason it is important to remove every particle of ovarian tissue, and never, on account of adhesions, to perform an incomplete operation. The operator must bear in mind the fact that the ovaries and the ends of the tubes can in every case be removed, no matter how deeply or densely imbedded in adhesions; first, by separating the adherent omentum and covering of the adherent intestines; secondly, by loosening the fundus uteri and by *unrolling* the broad ligament, which in deeply-imbedded cases nearly always folds backward over the prolapsed ovary; thirdly, by means of a strong finger-nail enucleating the ovary from its bed of adhesions to the floor of the pelvis and posterior and lower surface of the broad ligament. There are two important things to avoid; first, tearing of the intestine, especially near the sigmoid flexure; second, leaving a part of the pyogenic sac of an abscess of the ovary or tube. Hemorrhage ceases the moment the ligature is properly tied about the pedicle, unless the intestinal wall or the omentum or the uterine wall has been torn; for the adhesions invariably get their blood-supply either from the tube, ovary, or that part of the broad ligament which should be included in tying the pedicle, or from the omental vessels. I have never yet found it necessary to perform an incomplete operation. It is often the case that we cannot readily get a good pedicle and be able safely to cut away from the stump all of the tube or ovary; small pieces of ovarian tissue when densely adherent may be left unnoticed.

The most unsatisfactory cases are those which are associated with reflex symptoms. Hysteria and neuralgias are often but little affected by the operation.

I have lately noticed in several cases which I operated upon one, two, and three years ago that indurations, and even cystic tumors as large as oranges, have appeared in the broad ligaments near the pedicles, although I had done at the time what I considered a complete operation, as shown by the specimens. Menstruation has gone on very much in the same way as before the operation. In studying them I have found that they belong to two classes. In the one class, which is the more common, the adhesions are dense and strong and the ovaries have at the time of the operation several large cysts, often as large as oranges, which could not be removed except by bursting or by tearing them out—a part of the walls being practically so adherent as to make it impossible to know when all had been stripped off from the different organs. In some the cysts were so thin and numerous as strongly to resemble hydatids. In the second class the recurrent thickening is more solid and appears to be an enlargement of the stump of the tube near one or both sides of the uterus. I have reason to think that in two cases of the latter class lately returned for treatment the trouble is tubercular. I cannot say that the disease has reappeared or that it has continued to develop in the stump, but this seems to be the case. In many cases, especially where a drainage-tube has been used, an abscess forms around the stump of the pedicle; a sinus along the track of the drainage-tube is established, and continues to discharge pus until the ligature floats to the surface or until it is fished up with long slender forceps, as I have frequently done. This abscess is due either to the use of septic silk in tying the pedicle or to infection of the silk by the pyogenic end of the Fallopian tube where it is cut off and is not rendered aseptic by the application of the cautery or of some antiseptic to the end of the cut surface before dropping it. It may also be due to the drainage-tube coming directly in contact with the ligature and becoming infected by suppuration around the tube.

BIBLIOGRAPHY.

FOREIGN LITERATURE ON SALPINGITIS, UP TO 1885.

BOULAYE, CHAMBRY DE LA: "Observations sur une ossification trouvé dans la trompe droité, etc.," *J. de Med.-chir.*, Paris, xviii. 69, 1763.

MONRO: *An Essay on Dropsy*, London. 1765.

WEITBRECHT, J.: "Anatomical Observation in regard to Adhesions of the Walls of the Tubes," *Phys. und Med. Abhandl. d. Königl. Acad. d. Wissensch.*, p. 526, Riga, 1782.

BLUNDELL, J.: *Royal Med. and Chirzry. Soc. of London*, 1823.

GODELLE. "Observations sur une hémorrhagie d'une des trompes utérines," *J. Univ. d. Sc. méd*, xxx. 100, Paris, 1823.

SAGER: "Degeneration of Tubes," *J. f. Geburtsh.*, viii. 477, Frankfurt a. M., 1828.

FRORIEP: *Med. Zeitschrift d. Ver. f. Heilkunde*, No. 1, 1834.

PÉGOT: "Matière tuberculeuse renfermée dans les trompes," *Bull. Soc. anat. de Paris*, ix. 168, 1834.

MERCIER: "Fausses membranes qui ont complète oblit. le pavillon de la trompe, etc.," *ibid.*, xiii. 134, 1838.

CHURCHILL, F.. "On Inflammation and Abscess of the Uterine Appendages," *Dublin J. M. Sc.*, xxiv. 1–26, 1843–44.

PIGOLET, A. V.: "Altération organ. de la trompe de Fall.," *J. de Méd. chir. et. pharm*, Bruxelles, ii. 1–8, 1844.

PÉNARD: "Organes génitaux internes d'une femme morte phthisique; oblitera. des trompes," *Bull. Soc. anat. de Paris*, xxii. 11–15, 1847.

WATTS: "Tubercle in Fallopian Tubes, also in Lungs," *London M. Gaz., N. S.*, v. 1, 15, 1847.

SMITH, W. T.: "A New Method of Treating Sterility, by Remov. of Obstructs. of Fall. Tubes," *Lancet*, London, i. 529, 1849.

KIWISCH: *Clinical Lectures*, Part 2, p. 202, Prague, 1849.

ALBERS, J. F. H.: "Ueber die Einführung der Sonde in d. Fall. Tuben, u. d. Bildung eines künstl. Eileiters, etc.," *Rhein. Monatschr. f. p. Aerzte*, v. 441, 459, Köln, 1851.

RICHARD, A.: "Pavillons multiples rencontrés sur des trompes utérines de femmes," *Compt. rend. Soc. d. Biol.*, iii. 37, Paris, 1851.

FORSTER: *Handbuch d. Spec. path. Anatomie*, Leipzig, 1854.

GOUPIL: "Inflammation des trompes de Fall., etc.," *Bull. Soc. anat. de. Paris*, xxx. 199–204, 1855.

BERNUTZ: *Archives générales de Médecine*, 1857.

MARTIN: "On Salpingitis," *Verhandl. d. Gesellsch. f. Geburtshülfe*, xi. 224–252, Berlin, 1857–58.

WEST, CH.: *Lectures on Diseases of Women*, ii. 87, London, 1858.

HÉLIE: "Recherches sur la structure des trompes utérines, etc.," *J. de la Sect. de Méd. Soc. Acad. Loire-Inf.*, xxxiv. 261, 298, Nantes, 1858.

SCANZONI, FR.: *Diseases of the Sexual Organs*, 1859.

WAGNER, E.: *Monthly J. for Obstet.*, ii., Parts 414 and 436, 1859.

FORSTER: *Wiener med. Wochensch.*, Nos. 44 and 45, 1859.

MARTIN: *Monatsch. f. Geburtsk. und Frauenkr.*, xiii. 11, 40, Berlin, 1859.

VOCHE: "Salpingitis puerperalis," *Med. Vereins Zeit.*, 4, 1860.

PEUCH, A.: "Inflammation et abscès de trompes, etc.," *Soc. de Biol. Paris*, 3, S. i. 27, 30, 1860.

ROKITANSKY: "Ein Fall. von linksseitiger Tubarabschnürung, etc.," *Allg. Wien. Med. Zeit.*, v. 155, 1860.

HECKER: *Klinik der Geburtskunde*, p. 234, Leipzig, 1861.

MARTIN: *Monatsch. Geburtsk. und Frauenkr.*, 1861.

CHIPAULT: "Péritonite suraigne, etc.," *Bull. Soc. anat. de Paris*, xxxvi, 149, 1861.

BERNUTZ ET GOUPIL: *Clinique médicale des Femmes*, 1862.

BARNES, R.: *Transactions of the Path. Soc. London*, iii. 419, 1862.

MARTIN: *Monatsch. Geburtsk. und Frauenkr.*, xiv. 3–5, 1862.

ALMAGRO: "Double abscès tubaire dans la trompe droite, etc.," *Bull. Soc. anat. de Paris*, xxxvii. 171–175, 1862.

PELVET: "Tuberculisation des trompes utérines, etc.," *ibid.*, xxxviii. 235, 1863.

KLOB: *Path. Anat. Female Sexual Organs*, Wien, p. 228, 1864.

LECHLER: "Rupture of the Tubes," *Med. Cor. bl. d. Würtemb. Aerztl. ver. Stuttg.*, xxxiv. 110, 1864.

FONTAN: "Infiltration tuberculeuse des trompes," *Bull. Soc. anat. de Paris,* xxxix. 58, 60, 1864.

SCHUTZENBERGER, C.: "Affection des trompes de Fall.," *Gaz. méd. de Strasb.,* xxiv. 1-3, 1864.

HUTER, C.: "Concerning Adhesions of Tubes," *Verhandl. d. Gesellsch. f. Geburtsh. in Berl.,* xvii. 92, 1864.

———: "Cystis tubo-ovarica dextra." *Allg. Wiener med. Zeitsehr.,* x. 333, 1865.

———: *Arch. f. Heilkunde,* p. 285.

———: *Dessauer Monatsch. f. Geburtskunde,* pp. 27 and 60, 1866.

WAGNER: "A Case of Peritonitis due to Perforation of Right Fallopian Tube, etc.," *Arch. f. Heilk.,* Leipzig, vii. 285, 1866.

MEADOWS, A.: "Case of Cyst of Fallopian Tube," *Tr. Obst. Soc.,* viii. 139-142, London, 1866.

WAGNER: *Verhandl. d. Gesell. f. Geburtsh.,* Berlin, xxi. 174–176, 1867–69.

BIZZOZERO, G.: "Penetrazione di un ascaris lumbricoides nella tromba Fall. destra," *Morgagni,* Napoli, ix. 424, 1867.

HILDEBRANDT, H.: "Ueber das Sondiren der Tuben," *Monatsch. f. Geburtsk. u. Frauenkr.,* xxxi. 447, Berlin, 1868.

KELLY, C.: "Dilatation of the Fallopian Tubes," *Tr. Path. Soc.,* xix. 290, London, 1868.

———: *Monatsch. f. Geburtsk. u. Frauenkr.,* xxxiii. 19–21, Berlin, 1869.

WERNICH: "Preparation illustrating Tuberculosis of Tubes," *Beitrage z. Geburtsk. u. Gynäkol.,* 149, Berlin, 1870–71.

BARELLAI, G.: "Observazione di una tuberculosi d. Tube Fall., etc.," in his *Mem. s. Osp. marini, etc.,* Firenze, 1870.

CURTIN, R. C.: "Obliteration of the Fallopian Tubes, etc.," *Tr. Phil. Obst. Soc.,* New York, i. 27–29, 1870.

HENNIG: "Anatomy and Pathology of the Fallopian Tubes," *Bost. Med. and Surg. Journ.,* lxxxiv. 75–79, 1871.

NOEGGERATH, E.: *Die latenta Gonorrh. im weiblichen Geschlechte,* Bonn, 1872.

HENNIG, C.: "On Catarrhal Salpingitis," *Am. Journ. Obst.,* New York, v. 416–495, 1872-73.

———: "Observations of a Case of True Dropsy of Tubes," *Beitrage z. Geburstk. u. Gyn.,* ii. 93, Berlin, 1872–73.

MACDONALD, ANGUS: "Latent Gonorrhœa in the Female Sex, with Specific Relation to the Puerperal State," *Edinburgh Journ.,* pp. 1086–1104, June, 1873.

KLOB, J. M.: "Pathological Anatomy of Fallopian Tubes," *Am. Journ. of Obst.,* New York, vi. 83–91, 1873.

TAIT, L.: *Pathology and Treatment of Diseases of Ovaries* (Hastings' essay), 1873.

LIONVILLE: "Tuberculisation des trompes, etc.," *Bull. Soc. anat. de Paris,* 5 S. viii. 523, 1873.

SCHROEDER: *Diseases of Female Sexual Organs,* p. 318, Leipzig, 1874.

COYNE: "Tuberculose généralisée, etc.," *Bull. Soc. anat. de Paris,* xlix. 269-272, 1874.

SEUVRE: "Des hémorrhagies des trompes, etc.," *Progrès méd.,* Paris, ii. 215-234, 1874.

NOEGGERATH: *Journ. of Obstetrics,* New York, Feb. 16, 1875.

RONDOT, E.: "Dilatation des trompes, etc.," *Bull. Soc. anat. de Paris,* 3 S. x. 273–276, 1875.

HENNIG, C.: *Diseases of the Tubes,* 1876.

———: *Catarrh of the Tubes,* Stuttgart, 1876.

LÉGER: "Adhérences et Oblitération des Trompes, etc.," *Bull. Soc. anat. de Paris,* 4 S. i. 620, 1877.

POLLÁK, L.: *Többrekeszü petefészektömlö kürtas* (Occlusion of the Fallopian Tube), xxi. 27, Budapest, 1877.

HENNIG, C.: *False Passages in the Fallopian Tubes,* xiii. 156, Berlin, 1878.

TAIT, L.: "Case of Retention of Menstrual Fluid in Fallopian Tube," *Brit. Med. Journ.*, London, i. 933, 1878.

BANDL: *The Diseases of the Tubes, Ligaments, etc.*, Stuttgart, 1879.

ZEISSEL: "Catarrh of the Female Sexual Organs, and its Complications," *Aerztl. Berl. d. k. k. Allg. Krank. z. Wien*, 207–212, 1879.

ISRAEL: "On Castration," *Verhandl. d. Berl. Med. Gesellsch.*, xi. pt. 2, 139, 146, 1879–80.

JACOBS: "Therapy and Pathology of the Female Sexual Organs," *Berl. kl. Wochensch.*, xvi. 510, 512, 1879.

HEGAR: "Castration," *Centr. Bl. f. Gynä.*, iii. 529, Leipzig, 1879.

———: *Handb. der Frauenkht.* redgt. von T. Billroth, 5 Absehnitt, Stuttgart, 1879.

DORAN, A.: "Papilloma of Fallopian Tubes, etc.," *Tr. Path. Soc. London*, xxxi. 174–179, 1879–80.

RICHTER: "On Castration," *Berl. kl. Wochensch.*, xvii. 741, 1880.

CERNÉ: "Suppuration des deux trompes et de l'ovaire gauche, etc.," *Progrès méd.*, Paris, viii. 613, 1880.

MERMAN: "Perforation (fatal) of a Tube in a Condition of Salpingitis," *Centr. Bl. f. Gyn.*, Leipzig, v. 513, 1881.

BRAUN VON FERMOULD: *Lehrb. d. gesammten Gynä.*, Wien, 2d ed., 1881.

ODEBRECHT: "Castration," *Berl. kl. Wochenschrift*, xviii. 220–240, 1881.

BURNIER: "A Case of Pyosalpinx with Rupture," *Zeitsch. f. Geburtsk. u. Frauenkr.*, vii. 411, Stuttgart, 1881.

DUNCAN, J. M.: "On Open Fallopian Tube," *Brit. Med. Journ.*, London, i. 383, 1881.

CAYLA, A.: "Tuberculose des trompes, etc.," *Bull. Soc. anat. de Paris*, lvi. 350–352, 1881.

FRITCH: *Diseases of Women*, Braunschweig, 1881.

HEGAR UND KALTENBACH: *Operative Gynäkology*, Stuttgart, ed. 2, 1881.

SAVAGE, T.: "Some Diseases of the Fallopian Tubes," *Brit. Med. Journ.*, ii. 1255, London, 1882.

SCHRAMM: "Tuberculosis of the Tubes considered in the Light of Pathological Anatomy," *Arch. f. Gyn.*, Berlin, xiv. 416, 1882.

MADER: "Oöphor. et salpingitis purulenta," *Berichte d. k. k. Krankenaust.*, 395, Rudolfstift in Wien, 1882.

BALADIN: *Kl. Vortrag aus d. Geb. d. Geburtsh. u. Gyn.*, St. Petersburg, 1 Heft, 1883.

TAIT, L.: *Pathology and Treatment of Diseases of the Ovaries*, revised ed., pp. 55–57, 1883.

ZEISS: "Pyo- and Hæmato-salpinx," *Centr. Bl. f. Gyn.*, vii. 745, Leipzig, 1883.

OMETCH: "Pyosalpinx," *ibid.*, viii. 289–293, Leipzig, 1884.

ALBERTS: "Hæmatosalpinx and the Reflex Theory," *Arch. f. Gyn.*, xxiii. 399–413, Berlin, 1884.

ROTHE, C. G.: *Compend. of Diseases of Women*, Leipzig, 1884.

———: *Arch. für Gyn.*, Band 24, 2d Heft, p. 305, 1884.

MARTIN: *Therapie d. Frauenkr.*, Berlin, 1885.

MARTIN, A.: *Pathology and Therapy of Female Diseases*, Wien, 1885.

AMERICAN LITERATURE ON DISEASES OF THE TUBES, UP TO JAN., 1885.

CARTWRIGHT, S. A.: "A Case of Ovarian Tumor removed per vias naturales, by catheterism of the Fallopian Tube," *New Orleans Med. and Surg. Journ.*, vii. 804–807, 1850–51.

BRICKELL, E. W.: "Catheterism of the Fallopian Tubes," *Charlestown Med. Journ.*, vii. 169–171, 1852.

McCABE, F. M.: "A Case of Abscess of the Uterine Appendages in the Non-puerperal State," *West. Journ. Med. and Surg.*, Louisville, Ky., 4 S. iv. 187, 1855.

WARREN, J. M.: "Occlusion of the Uterus; Rupture of the Fallopian Tubes; Peritonitis; Death," *Boston Med. and Surg. Journ.*, lviii. 459, 1858.

STONE, L. R.: "Rupture of the Left Fallopian Tube, etc.," *Boston Med. and Surg. Journ.*, lxiv. 249, 1861.

ELLIS: "Dropsy of the Fallopian Tubes and Ovaries," *ibid.*, lxix. 422, 1863.

BIGELOW, J. M.: "Bilateral Dropsy of the Fallopian Tubes," *Trans. Med. Soc. County Albany*, ii. 365, 1869.

PEASLEE, E. R.: "Case of Dropsy of Fallopian Tubes, etc.," *Med. Rec.*, New York, iv. 69, 1869.

CURTIN, R. C.: "Obliteration of the Fallopian Tubes, accompanied by amenorrhœa and sterility," *Trans. Phil. Obst. Soc.*, New York, i. 27, 1870.

SULLIVAN: "Large Fibrous Fallopian Tumor removed by Abdominal Section," *Journ. Gynæc. Soc. Boston*, iii. 361–363, 1870.

PEPPER, W.: "Cystic Distension of the Fallopian Tubes," *Proc. Path. Soc. Philada.*, iii. 159, 1871.

ASHFORD, F. A.: "Patulous Fallopian Tube," *Nat. M. J.*, Washington, ii. 212, 1871–72.

WYLIE, W. G.; *Am. J. of Obst.*, vi. p. 43, 1871–72.

HENNIG, C.: "Anatomy and Pathology of the Fallopian Tubes," *Bost. M. and S. J.*, lxxxiv. 75–79, 1871.

BOYD, J. P., JR.: "Fallopian Salpingitis," *Philada. Med. Times*, iv. 317, 1873–74.

KLOB, J. M.: "The Pathological Anatomy of the Fallopian Tubes," *Am. J. Obst.*, New York, vi. 83–91, 1873.

BAIRD, J. B.: "Report of a Fatal Case," *Atlanta M. and S. J.*, xi. 691, 1874.

MARKESAN, T. M.: "A Case of Salpingitis," *Tr. Wisconsin Med. Soc.*, Milwaukee, viii. 62–64, 1874.

INGHAM, J. V.: "Two Cases of Hydrops Tubæ Fallopii," *Am. J. Obst.*, vi. 638–642, 1874.

NEWMAN, R.: "Salpingitis with Anomalous Symptoms," *Med. Rec.*, New York, xi. 410, 1876.

NICOLL, H. D.: "Case of Death from Rupture of Fallopian Tube and Intraperitoneal Hemorrhage," *Tr. N. Y. Obst. Soc.*, i. 156, 1876–78.

NEWMAN: "Tubular Cyst of Fallopian Tube," *N. Y. M. J.*, xxiii. 628, 1876.

PEASLEE, E. R.: "Dropsy of the Fallopian Tubes," *Tr. N. Y. Path. Soc.*, iii. 250–253, 1879.

JANEWAY, E. G.: "Fallopian Abscess," *ibid.*, iii. 254, 1879.

CHADWICK AND OTHERS: Discussion, *Amer. Gyn. Soc. Transactions*, 1880.

LUSK, D. T.: "General Peritonitis, Ovaritis with Abscess, Dilatation, and Inflammation of Outer Extremity of Fallopian Tubes," *Am. J. Obst.*, New York, xiii. 124, 1880.

JANEWAY, E. G.: "Obscure Case of Obstipation, etc.," *N. Y. M. J.*, xxxii. 522–524, 1880.

THOMAS, T. G.: "Fibrous Cyst of Fallopian Tubes," *ibid.*, xxxiv. 67, 1881.

THOMAS, C. H.: "Patulous Fallopian Tubes," *Philada. Med. Times*, xii. 469, 1881–82.

SKENE, A. J. C.: "Dropsy of the Fallopian Tube," *Am. J. Obst.*, New York, xiv. 877, 1881.

WALKER, H. F.: "Septicæmia; Abscess in the Fallopian Tube," *ibid.*, New York, xiv. Suppl. 35, 1882.

CHASE, S. L.: "Two Quarts of Blood in the Abdominal Cavity; Ulceration of the Fallopian Tubes," *M. and S. Reporter*, Philada., xlvi. 391, 1882.

HARTIGAN, J. F.: "Rupture of the Left Fallopian Tube, and Copious Hemorrhage into the Peritoneal Cavity," *A. M. J. M. Sc.*, Philada., xxxiv. 77–81, 1882.

GARDNER: "Ovaries and Fallopian Tubes Removed," *Canada M. Rec.*, Montreal, xi. 242, 1882–83.

EARNEST, J. G.: "Pelvic Cellulitis," *Atlanta M. Reg.*, ii. 65–77, 1882–83.

BYFORD, W. B.: "Remarks on Interpelvic Inflammation in the Chronic Form," *J. Am. M. Ass.*, Chicago, i. 225–229, 1883.

GARNETT, A. Y. P.: "The Advantage of Drainage in Suppurative Pelvic Peritonitis and Cellulitis," *Am. J. Obst.*, New York, xvi. 1041–1048, 1883.

CAMPBELL, H. F.: "Menstruation after Extirpation of the Ovaries," *Med. News*, Philada., xliii. 346–348, 1883.

DAWSON: "Explora. Laparotomy three years after Battey's Operation," *Am. J. Obst.*, New York, xvi. 943, 1883.

MUNDÉ, P. F.: "Battey's Operation for Dysmenorrhœa and Pelvic Neuralgia," *ibid.*, xvi., 944, 1883.

WYLIE, W. G.: "Double Salpingo-ovariotomy; recovery," *Med. Rec.*, New York, xxiv. 314, 1883.

DAWSON, B. F.: Tait's Operation," *Am. J. Obst.*, New York, xvi. 1191–1193, 1883.

NICOLL, H. D.: "Tait's Operation," *ibid.*, xvi. 1190, 1883.

TRENHOLME: "Two Pairs of Ovaries and Fallopian Tubes removed from Patients," *Canada M. Rec.*, Montreal, xii. 5, 1883–84.

BATTEY, R.: "Antisepsis in Ovariotomy and Battey's Operation; Eighteen Consecutive Cases, all successful," Richmond, J. W. Ferguson & Son, 16 pp. 8vo, reprint from *Virginia Med. Monthly*, 1883.

BAKER, J. M.: "Oöphorectomy or Battey's Operation; case," *North Car. M. J.*, Wilmington, xii. 61–65, 1883.

THOMAS, T. G.: "A Contribution to the Subject of the Removal of the Uterine Appendages (Tait's Operation) for prolonged menstrual trouble, with recurrent pelvic inflammation," *N. Y. M. J.*, xxxvii. 32–35, 1883.

DRAKE, N. A.: "Report of Case of Battey's Operation," *St. Louis M. and S. J.*, xliv. 555–561, 1883.

HAWKINS, J. H.: "Removal of Ovaries and Fallopian Tubes, etc. (Battey-Tait Operation)," *Denver Med. Times*, iii. 289, 1883–84.

WILL, O. B.: "Cystic Degeneration of Ovary: Battey's Operation; death," *Peoria M. Month.*, iv. 419–425, 1883–84.

THOMAS, T. G.: "Two Cases of Extirpation of the Ovaries," *Med. Chron.*, Balt., ii. 161, 1883–84.

MUNDÉ, P. F.: "Three Successful Cases of Oöphorectomy," *N. Eng. M. Month.*, Sandy Hook, Conn., iii. 549–557, 1883–84.

VON HOFFMANN, C.: "Case of Successful Removal of Both Ovaries and Fallopian Tubes," *San Fran. West. Lancet*, xiii. 1–4, 1884.

THALLON, W. M.: "Battey-Tait Operation," *Arch. Med.*, New York, xi. 180–206, 1884.

HOMANS, J.: "Hysteria as Affected by Removal of Ovaries," *Bost. M. and S. J.*, cx. 542–544, 1884.

JACOBI, MARY P.: "Salpingo-oöphorectomy," *N. Y. M. J.*, xxxix. 673, 1884.

WALTON, G. L.: "Hysteria as Affected by Removal of the Ovaries," *Bost. M. and S. J.*, cx. 529–532, 1884.

GOODELL, W.: "Pyosalpinx and Hydrosalpinx," *J. Am. M. Ass.*, Chicago, iii. 21, 1884.

RUSSELL, A. J.: "Three Cases of Non-puerperal Pelvic Cellulitis," *Denver M. Times*, iv. 45–51, 1884–85.

MOSES, G. A.: "Pelvic Inflammations," *St. Louis Cor. Med.*, xii. 161–166, 1884.

DAWSON, B. F.: "Two Cases of Oöphorectomy," *Am. J. Obst.*, New York, xvii. 964–967, 1884.

SIMONS, M.: "Laparotomy, with Removal of Cysto-fibroma of the Uterus and a Small Cyst of Broad Ligament, with both Ovaries and Fallopian Tubes," *Med. News*, Philada., xlv. 315, 1884.

TAIT, L.: "A Clinical Lecture: Pyosalpinx following Gonorrhœa; Extirpation of the Fallopian Tubes, etc.," *N. Y. M. J.*, xl. 421, 1884.

———: "Abdominal Section in Disease of the Uterus and Uterine Appendages," *Med. News*, Philada., xlv. 337–342, 1884.

GOODELL, W.: "Two Cases of Oöphorectomy," *Am. J. Obst.*, New York, xvii. 1185, 1884.

JONES, MARY D.: "A Case of Tait's Operation," *ibid.*, xviii. 1154, 1884.

MUNDÉ, P. F.: "Removal of the Ovaries and Fallopian Tubes, etc.," *ibid.*, xvii. 1162, 1884.

TAIT, L.: "Removal of Uterine Appendages," *Arch. Med.*, New York, xii. 74–79, 1884.

TRENHOLME, E. H.: "Notes of Six Cases of Removal of Ovaries and Fallopian Tubes," *Canada Med. Rec.*, Montreal, xiii. 25–28, 1884–85.

WEEKS, S. H.: "Oöphorectomy," *Tr. Maine M. Ass.*, Portland, viii. part 2, 340–344, 1884.

ADAMS, C. D.: "Pelvic Cellulitis a Misnomer," *Med. Index*, Kansas City, v. 375–380, 1884.

MARTIN, F. H.: "A Successful Case of Abdominal Section for Pyosalpinx, treated by Volkmann's method," *Chicago M. J. and Exam.*, xlix. 435–439, 1884.

WYLIE, W. G.: "Diseases of the Fallopian Tubes, with report of cases," *Med. Rec.*, New York, Jan. 24 and Feb. 7, 1885.

THE PATHOLOGY OF OVARIAN TUMORS.

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INTRODUCTION.—The uncertainty and consequent confusion which
obtain in the field of ovarian pathology become evident even to the
casual reader of its literature, and may easily be traced to our imper-
fect knowledge of the physiology of this, the most protean of glands, as
well as to the fact that many questions relating to its histological struc-
ture, the solution of which is essential to our complete understanding
of a most perplexing subject, are still matters of doubt and controversy.
It is to be hoped, however, that the brilliant achievements of antiseptic
surgery during the past two decades, resulting as they have in the
establishment of ovariotomy as the most successful of all the major
operations, may so stimulate research that this maze of conflicting views
which now confronts the student may give place to definite and well-
grounded facts. That this desirable end is capable of attainment
admits of no doubt, though an appreciation of the intrinsic difficulties
of the subject, as demonstrated by the experiences of the past, forbids
the hope that we shall welcome this ovarian millennium in the near
future.

The ovary, as we know, is developed from the comparatively flat,
oblong mass of mesoblastic cells constituting the genital ridge, which
lies on the mesial side of the Wolffian body. This cell-mass has a
bilaminar arrangement, the outer thickened stratum of proliferating
epithelium, or that facing the pleuro-peritoneal cavity of the embryo,
completely covering the more deeply seated layer of modified mesoblast.
As the development of the ovary progresses, the outer layer, bending
in the direction of its long axis, gradually encloses the inner, till finally
the latter remains exposed only at the site of the future hilum; while
the outer stratum of columnar cells (germinal epithelium of Waldeyer)
merges abruptly into the pavement epithelium of the peritoneum. Such
an ovary is, on section, found to be made up of two parts or zones: first,
a cortical or parenchymatous; second, a medullary or vascular zone. Of
these zones, the former, with its layer of cylindrical epithelium and im-
bedded glandular structures, corresponds with the *mucosa* of a mucous

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membrane; while the latter, or vascular zone, resembles the vascular *stratum submucosum.* That the ovigerms and primitive ova are derived from the germ-epithelium has been fully established by the labors of Waldeyer[1] and many others, though the precise manner in which these are enclosed in the follicles of De Graaf is still a *quæstio vexata.* The marked multiplication of the germinal cells which characterizes the earliest stages of ovarian development is attended with changes in their size and appearance, some, while still near the surface, outstripping the others in growth and coming to resemble the primordial ova. As these ovigerms and primitive ova increase in number they naturally tend to recede from the surface, and thus invade the deeper blastema or modified mesoblast, the cells of which are simultaneously developing into the connective or fibro-nuclear tissue of the future stroma. Thus a mutual intergrowth of epithelial and stromal structures ensues, resulting in the imbedding of groups or nests of ovigerms, each of which may or may not include one or more of the primordial ova developed in the layer of germ-epithelium. At first the ovigerms constituting the cell-nests are usually wellnigh uniform in appearance and size; very soon, however, one or more of the cells, continuing to develop, acquire the characteristics of ova, while the others become smaller and lose their spherical shape.

<div align="center">Fig. 319.</div>

Vertical Section through the Ovary of a Human Fœtus of thirty-two weeks (Waldeyer): *a*, epithelium; *b*, primordial ova; *c*, trabeculæ of connective tissue invading the epithelial stratum; *d*, groups of epithelial cells becoming imbedded; *e*, primordial follicles lined with narrow connective-tissue cells; *f*, groups of epithelial cells already imbedded and including some larger cells (primordial ova); *g*, granular cells of His.

It is from these cell-nests of various sizes, which transform the cortical zone of the ovary in its early stages of development into a cavernous network, that the primordial follicles are formed by the continuous invasion of the vascular, spindle-celled connective tissue, each follicle containing usually but a single ovum, though occasionally two, and

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[1] Wilhelm Waldeyer: *Eierstock und Ei*, Leipzig, 1870.

very rarely three, ova have been found. That the cellular lining of the
Graafian follicles, the *membrana granulosa*, is formed by the smaller
cells resulting from the multiplication of the germ-epithelium, and
which, with the ovum, are included in the newly-formed cavity of
ovarian stroma, is now pretty well established by the researches of
Waldeyer, Ludwig, Balfour, and others; though, as a matter of course,
dissenting voices are heard here likewise. Thus, Foulis, struck by the
resemblance which the flattened, spindle-shaped elements lining the
smallest ovisacs bear to the cells of the ovarian stroma, was led to
ascribe their origin to the differentiation of the latter, rather than to
the germinal epithelium—an assumption apparently at variance with
existing doctrines, since it implies the direct metamorphosis of connec-
tive-tissue elements into epithelial cells, and thus combats the dogma
that epithelium can arise from epithelium alone. The importance of
Foulis' view, however, and the advisability of early settling its truth
or falsity, become evident when we consider that by it a purely stromal
origin for ovarian cysts is admitted, there being no reason to suppose
that under certain morbid influences such follicular cells may not form,
to develop later into a cystic tumor. While admitting with Waldeyer
the derivation of the ova from the germinal epithelium, Kölliker,[1]
seconded by Rouget, refers the origin of this granular-cell lining of
the follicles to the epithelium of the peculiar tortuous and branched
medullary cords and tubules first observed by Waldeyer, which persist
for a time in the ovarian hilum as vestiges of the Wolffian body.
When the ovaries of some of the lower animals are examined, it is
found that the germ-epithelium apparently invades the subjacent stroma
in the form of long tubular structures, the outer ends of which are con-
tinuous with the epithelial covering of the ovary, while the inner or
blind extremities lie at various depths in the cortex. The studies of
Valentin,[2] the first to direct attention to this subject, were afterward
supplemented by the more elaborate investigations of Pflüger,[3] accord-
ing to which each of these tubiform masses of cells is surrounded by
a *membrana propria*,[4] and contains within its lumen ova, generally in
rows. In the human ovary these long, branched, anastomosing cords
or tubes of rounded or polyhedral cells, the so-called "tubes of Pflü-
ger," are present from about the ninth month of fœtal life to shortly
after birth, evidently replacing, in part at least, the spherical clusters
or nests of imbedded cells which had imparted to the gland in its ear-
lier stages the exquisitely cavernous structure to which we have already

[1] *Entwickelungsgeschichte des Menschen und der höheren Thiere,* Leipzig, 1884.
[2] G. Valentin: "Ueber die Entwicklung der Follikel in dem Eierstock der Säuge-
thiere," *Müller's Arch. f. Anat. u. Phys.*, 1838, S. 526.
[3] E. Pflüger: *Die Eierstöcke der Säugethiere und des Menschen,* Leipzig, 1863.
[4] Waldeyer denies the existence of this tubular basement membrane.

alluded. These tubes are separated by relatively wide intervals, communicate with the surface-epithelium through narrow orifices, and, below, their blind extremities are surrounded by groups of primordial follicles, as shown in Fig. 320.

FIG. 320.
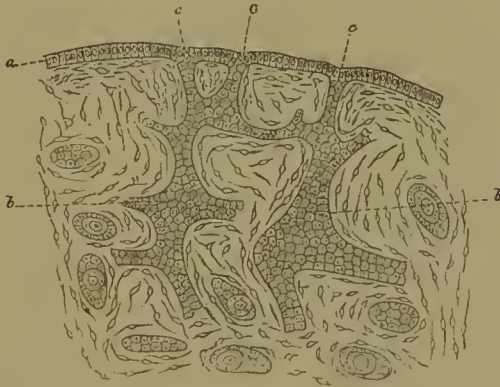
Vertical Section through the Ovary of a Newborn Child (Waldeyer): *a*, germinal epithelium; *b*, Pflüger's tubes, connecting with the epithelial covering of the gland at *c*.

This secondary formation of the tubes of Pflüger from the cell-nests of the zona parenchymatosa is attributed by Waldeyer to the irregular growth of the interstitial connective tissue, whereby numbers of communicating spherical collections of ovigerms are converted into the tubular structures, which in some instances may likewise be separated from the surface covering of germinal epithelium by the encroachments of the stroma. Though Pflüger's tubes have been found at various ages, even as late as the seventy-fifth year, it is probable that, as a rule, they disappear soon after birth, their subsequent appearance being oftentimes due to the persistence of the fœtal structures, the normal conversion into follicles having failed to take place. Ordinarily, however, the primitive ovisacs are formed from the tubes of Pflüger, just as from the cell-nests, by the constricting growth and proliferation of the fibro-nuclear connective tissue; and, inasmuch as this stromal development is most marked in the vicinity of the vascular zone, successive portions of the lower ends of the tubes, each with its enclosed ovum, are thus separated. Though these tubes of Pflüger play a very important rôle in the histogenesis of ovarian cysts, according to wellnigh all of the modern German pathologists and writers, and though MM. De Sinéty and Malassez of the French school, in their valuable and comparatively recent contribution to ovarian literature,[1] uphold the existence of these structures by basing their theories largely upon them, still, professional opinion, particularly in England and in our own

[1] "Sur la Structure, l'Origine, et la Développement des Kystes de l'Ovaire," *Arch. de Phys.*, 1878, vols. vi. and vii.

country, is apparently indisposed to indorse the views of Valentin, Pflüger, and Waldeyer regarding this point. " In the development of the ovary," says Foulis,[1] "small and large groups of the germ-epithelium cells become gradually imbedded in the ever-advancing stroma. Germ-epithelial cells do not grow downward into the substance of the ovary : the ovarian stroma constantly grows outward, surrounding and imbedding certain of the germ-epithelial cells. As these latter increase in size, and as the stroma thickens around them, the whole ovary becomes enlarged. Pflüger's tubes in the kitten's ovary have no existence as such, but are appearances produced by long groups of germ-epithelial cells, many of which groups are not completely cut off from the germ-epithelial layer by the young ovarian stroma. Such groups of germ-epithelial cells in various forms are met with in all ovaries, but have no importance whatever as tubular structures. In the human child's ovary numerous furrows or clefts between irregularities of the surface are met with. Sections through these furrows and clefts produce the appearance as if the germ-epithelium (pseudo-epithelium, Balfour) passed downward into the ovary in the form of tubular open pits, as was described by Waldeyer and his predecessors. No real tubular structures, from which Graafian follicles are formed, exist in the mammalian ovary at any stage of its development. Graafian follicles are formed only in one way from the beginning of the ovary to the end of its existence. According to Balfour,[2] the tubes of Pflüger are simply trabeculæ of germinal epithelium formed from the parenchyma by stromal ingrowths ; while Doran[3] regards the term as one applied to what is merely an appearance, the so-called tubes representing simply the fortuitous grouping here and there in the ovarian stroma of follicles in rows. Tait, on the other hand, denies the existence of these tubes in the cortex, declares that they appear only in the ovarian hilum, and would have us believe them identical with the tubular remains of the Wolffian structures and quite independent of the germinal epithelium."[4]

This conflict of opinion concerning the nature, origin, and development of the various constituents of the ovarian parenchyma is unhappily not confined to the glandular or productive portion of the organ, but extends to some of the stromal tissues as well ; and, in order that the reader may be better prepared to appreciate the diverse views advanced in explanation of the various pathological processes about to be considered, it will perhaps be well to include here a brief con-

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[1] "The Development of the Ovary," *Journ. Anat. and Phys.*, vol. xiii. pt. 3.

[2] "On the Structure and Development of the Vertebrate Ovary," *Quar. Journ. of Micros. Science*, 1878, vol. xviii.

[3] *Tumors of the Ovary, Fallopian Tube, and Broad Ligament*, London, 1884.

[4] *Vide* Tait on *Diseases of the Ovaries*, 4th Amer. ed., pp. 16 and 157.

sideration of these desmoid structures and of their mooted interpretation.

Aside from the epithelium and the follicles composing the parenchyma of the ovary, we find the texture of the organ made up of connective tissue, smooth muscular and elastic fibres, through which ramify the blood-vessels, nerves, and lymphatics. The bulk of the ovarian stroma, however, is made up of connective tissue, in which are found large numbers of spindle-shaped cells, besides others of a polyhedral and round form. The round cells are largely the so-called wandering cells or leucocytes, though some doubtless are of the connective-tissue variety; while those of an irregular or polyhedral shape are of Wolffian origin, being the analogues of the interstitial cells found in the intertubular substance of the testicle. Considerable diversity of opinion exists, on the other hand, respecting the spindle cells, which are found in special abundance in the vicinity of the Graafian follicles; and it is to this very uncertainty in the classification of these normal cellular constituents of the ovarian stroma that much of the present confusion in differentiating tumors of a fibrous, muscular, and sarcomatous nature may be traced. While it is conceded that the amount of muscular tissue in the stroma is by no means insignificant, its occurrence is wellnigh, if not entirely, limited to the medullary portion of the organ, where it envelops the larger blood-vessels in the form of sheaths. This is, of course, contrary to the views of Rouget, Aeby, and others, who ascribe to the smooth muscular tissue a large share in the construction of the ovarian stroma, both superficial and deep. It is His,[1] however, who goes farthest in this direction. This investigator would have us believe that all the fusiform cells found in the stroma of the ovary, which he includes under the name "spindle tissue," are smooth muscle-fibres, having a genetical connection with the blood-vessels, of which they represent merely the unravelled *tunicæ mediæ.* Careful study with the aid of carmine, chloride of palladium, and other chemical agents, as well as with electricity, has shown, however, that in this respect at least the opinions of the authorities just cited are untenable, inasmuch as the spindle cells deport themselves under these tests precisely as does connective tissue, of which they doubtless represent a young or embryonic type. This conclusion is strengthened by the fact that during puberty the number of fusiform cells in the deeper portion of the cortex is diminished, while the interfollicular fibrillar connective tissue undergoes a corresponding increase in amount—a condition of things best explained by assuming a direct metamorphosis of the cells into connective-tissue fibres.

[1] "Beobachtungen über den Bau des Säugethier-eierstocks," *Schultze's Arch. f. Mikros. Anat.,* Bd. i.

Of the thirty-six thousand follicles which, according to Henle's computation, exist in each ovary, none can be found even four years after the menopause.[1]   What has become of them?   The maturation and rupture of these vessels of De Graaf during the childbearing period accounts at best for less than 5 per cent. ; and the disappearance of the balance can be explained only by assuming that they perish abortively.[2]   That such is, in fact, their fate is attested by numerous evidences both ocular and microscopical, their remains being represented by the so-called *corpora fibrosa;* that is, by bright homogeneous membranes of various shapes and sizes, which may or may not include contents of a granular or filaceous nature.   The white cicatricial remains due to the growth and retrograde metamorphosis of the corpora lutea, both true and false, are also termed *corpora albicantia.*

It becomes evident, from this brief review of the complex structure of the ovary, that the difficulties attending the study and interpretation of its pathological conditions are both numerous and real.   We have seen that many points connected with the physiological anatomy of the organ, and having an important bearing upon its pathology, are still unsettled, still enveloped in the mists of plausible hypothesis.   Nor is this all with which the student has to contend.   The situation, as we know, is still further embarrassed by the fact that throughout life the ovary is normally the scene of constant alterations affecting both parenchyma and stroma, some of which seem perilously near the boundary-line between health and disease ; indeed, it oftentimes becomes difficult to decide whether the normal has not really merged into the pathological.   Experience teaches us, moreover, that an ovary in which not even microscopical signs of disease may be discovered is a rarity, to say the least.   The organ may continue to discharge its functions properly, it is true, and yet evidences of morbid change, varying in degree and involving the glandular structures, stroma, blood-vessels, or lymphatics, will almost invariably present themselves.

In the light of these facts it no longer surprises us, for example, to find theory after theory propounded in explanation of the histogenesis of ovarian tumors, or to hear the very existence of some form of neoplasm denied by one and upheld by another : it could hardly be otherwise, for, just as from the Scriptures evidence may be adduced in support of any special religious doctrine, so even preconceived opinions concerning ovarian pathology may, seemingly at least, be upheld by phenomena observed in this glandular complex.

[1] Waldeyer : *op. cit.,* p. 30.
[2] See Creighton's interesting description of the obsolescence of follicles, *Journ. of Anat. and Phys.,* vol. xiii.

Hoc ovarium est in quo quærit sua dogmata quisque;
Invenit et pariter dogmata quisque sua.

The classification of ovarian tumors is purely arbitrary, since it may be based upon any of the various features presented by these growths, whether clinical, structural, genetic, or otherwise; and the attempt to include all these characteristics would be manifestly impossible. If we regard the tumors from a histological point of view, they may be conveniently classed under three heads: *epithelial, connective-tissue* or *desmoid,* and *muscular,* as follows:

Ovarian Tumors.

- Epithelial
  - Adenoma.
  - Cystoma.
    - Simple follicular.
    - Proliferating.
      - Glandular.
      - Papillary.
    - Dermoid.
  - Papilloma.
  - Carcinoma.
- Connective-tissue or Desmoid
  - Fibroma.
  - Myxoma.
  - Enchondroma.
  - Sarcoma.
- Muscular—Leio-myoma.

In the present article, however, it will be more convenient to consider, first, the cystic, and then the solid tumors of the ovary, reserving for final discussion the tumors of the broad ligament and pelvis, save those of the uterus and Fallopian tubes.

FOLLICULAR CYSTS OF THE OVARY.

(*Hydrops follicularis,* Virchow.)

In the human ovary at birth the cellular lining of each Graafian follicle, constituting the membrana granulosa, closely invests the ovum, there being no fluid present; but at the approach of puberty a serous exudate begins to accumulate within the more superficial ovisacs, producing a gradual increase in their size. As the time for the discharge of the ovum draws nigh the walls of the follicle become more vascular, the intra-follicular fluid increases in amount, while the tunica albuginea and epithelial investment of the ovary yield before the steadily enlarging ovisac, until it finally protrudes from the surface of the gland as a tense, translucent vesicle. The next event in the physiological cycle would be the rupture of the follicle at its weakest point (the stigma),

followed by the discharge of the ovum; should this not ensue, however, the condition of affairs assumes a pathological aspect, dropsy of the follicle supervenes, and the career of a retention-cyst is initiated.

These follicular retention-cysts may occur in one or in both ovaries;

FIG. 321.
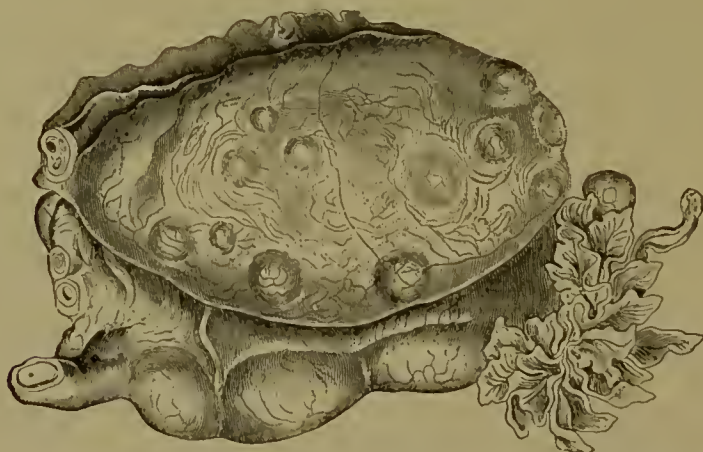
Ovary with Numerous Distended Follicles (Olshausen, after Leopold).

may be small or large, single or multiple; and, though most frequently observed during the period of sexual activity, may form at any age. When present late in life the normal shrinkage of the surrounding stroma, due to physiological atrophic processes, causes the cysts to

FIG. 322.

Bilateral Multiple Cystoma (Farre, after Hooper): a, right ovary, exhibiting numerous unilocular cysts consisting of enlarged Graafian vesicles; b, left ovary, similarly affected, but unopened; c, uterus.

project more prominently from the surface of the ovary, and in well-marked cases may give them a pedunculate appearance. The mere occurrence of the liquor folliculi in a fœtal ovary stamps the case as one of dropsical degeneration, while in the adult the normal size of the fully-developed ovisae is to be considered before pronouncing the

condition to be pathological. Though but one follicle may be involved, it is usually the case that a greater or less number (ten to twenty) are affected from the beginning; and these may enlarge either uniformly or the reverse. Usually, however, one follicle outstrips the others in growth, and may attain the size of a man's fist, or, in exceptional instances, a child's head, the whole tumor rivalling, or even exceeding, in bulk the head of an adult. This size, however, is but rarely observed. Less frequently two or three cysts may thus develop into prominence at the expense of the others, which either cease to enlarge or undergo atrophy from pressure. Such tumors, then, are usually unilocular or monocystic, though where two or more cysts are concerned, as in the latter instance, we have the much rarer paucilocular, oligocystic, or multiple (Farre) tumor.

Pressure may cause coalescence and atrophy of the walls of contiguous follicles, and thus two or more of the cysts may finally intercommunicate, though this very rarely occurs.

Walls.—In simple dilatation of the Graafian follicles the thickness and strength of the walls keep pace with the increasing eccentric bursting force exerted by the follicular contents, so that even in the large cysts the follicular membrane is thicker than in the ripe ovisac. Should this not occur, should the new connective tissue be formed too slowly or in amounts insufficient to meet the demands made upon it, the wall of the cyst becomes thinner and thinner at its most prominent part, and may finally give way, the contents of the diseased ovisac being expelled

FIG. 323.
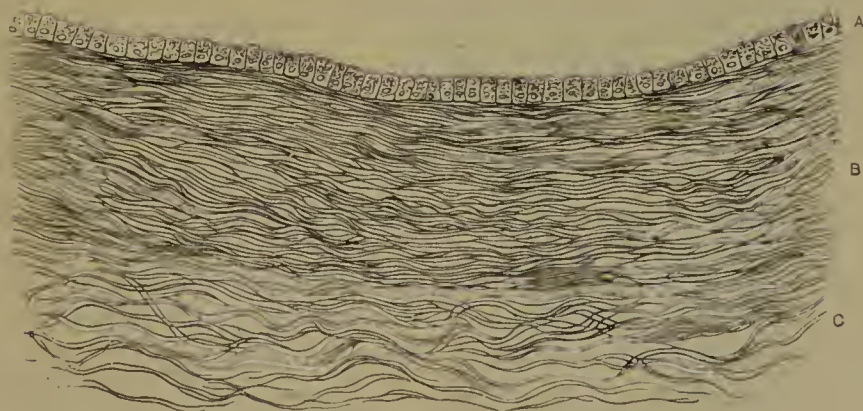
Section of the Wall of a Simple Ovarian Cyst: A, epithelial lining; B, dense fibrous layer; C, loose fibrous layer (Olshausen).

into the peritoneal cavity. The inner surface of these cysts is smooth, and lined with a single layer of cylindrical epithelium, which becomes thinner and more flattened as the pressure of the enclosed fluid increases; while sections show that their walls are composed largely

of fibrous tissue, in which the coats of the original ovisae, the tunica fibrosa and tunica propria of Henle, may at times be recognized.

Contents.—A clear, pure serum, having a specific gravity of 1005 to 1020, and resembling the normal liquor folliculi, is usually found within the cysts, though this fluid may be viscid, turbid, purulent, or may present the various shades of red or brown due to the presence of fresh or degenerated red blood-corpuscles. Except hemorrhage or suppuration has occurred, however, the morphological constituents of the fluid are few, though some epithelial cells may also be found. The chemical substances present are albuminoids, salts—especially chloride of sodium—and occasionally cholesterin.

The cystic degeneration of one or more Graafian follicles does not usually interfere with the occurrence of menstruation and pregnancy, healthy ovisaes being present in the intercystic stroma ; though in cases of follicular dropsy, marked both in degree and in the number of affected vesicles, condensation and atrophy of the remaining gland-tissue ensue, which in extreme cases may become complete. Though usually free from adhesions, these multiple[1] ovarian cystomata may be attached to the surrounding structures.

If some care be exercised, the degenerated ovisaes may be dissected or shelled out from the surrounding stroma, and removed intact for examination, this procedure being greatly facilitated by the presence of a stratum of loose connective tissue between the tunica fibrosa of the follicular wall and the ovarian stroma. The smaller vesicles may be opened directly upon a slide, the larger in some receptacle which affords a dark background, and thus aids the detection of any formed body resembling an ovum. Studies of this kind have resulted in the discovery of ova in the smaller cysts, though they quickly degenerate and become extinct as the dropsical follicle enlarges.

The first to note the occurrence of ova in multiple cystomata, and to thus definitely establish the histogenesis of this variety of ovarian tumor, was Rokitansky,[2] who in examining *post-mortem* the body of a woman aged twenty-six found that the right and left ovaries were as large as a child's head and a man's fist respectively. Each was composed of a number of cysts as large as cherries, most of which were closely packed together, flattened here and there by mutual pressure, and occasionally projecting into each other. The surfaces of the tumors were thus slightly lobulated, and between these larger protuberances were seen smaller cysts, ranging in size from a barley-corn to a bean.

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[1] The term *multiple* is employed, as suggested by A. Farre, to distinguish the tumor formed by the aggregation of two or more simple cysts of contemporaneous growth from the *multilocular, compound,* or *proliferous* variety, in which the secondary cysts are the result of endogenous proliferation.

[2] *Wochenblatt der Zeitschrift der k. k. Gesellschaft der Aerzte zu Wien,* Bd. i. 1855.

When opened these smaller cysts discharged a greenish fluid containing membranous floceuli, and in each of them was found an ovum, softened, dull in color, and easily disintegrated. The sharp contour of the zona pellucida had almost disappeared, and, with one exception, no germinal vesicle could be discovered. About ten years subsequently, in 1864, Sir Spencer Wells operated upon a woman fifty-four years of age at the Samaritan Hospital, London, removing both diseased ovaries. The tumors were about the size of an adult's head, and composed of clusters of variously-sized vesicles.

FIG. 324.

Dr. Charles Ritchie first called attention to the fact that in each of the tumors there were a number of small cysts which were evidently enlarged Graafian follicles. This view was confirmed by Drs. Ritchie and Webb, both of whom found ova in the smaller cysts; and the former subsequently says:[1] "Since last August (1864) I have succeeded in finding ova in some of the loculi of a large number of ovarian cysts. Some of the ova were perfect, with a sharply-defined zona pellucida, a germinal vesicle, and a germinal spot; others were more or less imperfect, many having the appearances mentioned by Rokitansky. I have never found an ovum in a loculus larger than a cherry, and never in a loculus which contained jelly-like contents." Mr. Lawson Tait is the only observer, other than those already mentioned, who has met with instances of this form of multiple cystoma — "Roki-

Multiple Ovarian Cystoma of Rokitansky (Tait).

tansky's tumor" as Tait terms it—and his experience is limited to two cases. One of the tumors removed from Tait's second case is

[1] Ritchie, *Ovarian Physiology and Pathology*, London, 1865.

figured in the accompanying illustration (Fig. 324). On the right side is seen the omentum, the resection of the major part of which was necessitated by the existence of localized adhesions and the fact that many of the component cysts of the tumor had apparently grown through its meshes. Each of the loculi examined by Mr. Tait was lined with columnar epithelium, and contained a more or less perfect ovum; whence he infers that every sac represents a Graafian follicle distended by an excess of the liquor folliculi.

ETIOLOGY.—It is quite certain that no one cause exists to the exclusive agency of which all cases of follicular dropsy can be satisfactorily ascribed; and it is doubtless in recognition of this fact that almost every author advances arguments in favor of some special theory which oftentimes has little else than its evident ingenuity to commend it. That inflammation, however, both in its immediate and secondary effects, plays an important rôle in this connection is quite evident. The increased congestion of the follicular walls attending the inflammatory process would certainly be attended with an increased exudation into the ovisac, to say nothing of any direct effect upon the ovum itself; while the formation of new connective tissue in the ovarian stroma, coupled, it may be, with pseudo-membranous deposits upon the surface of the gland, would tend to retard the rupture of the follicle, and thus convert it into a retention-cyst. It is a fact that the stroma is generally found greatly condensed in cases of follicular dropsy; and Chrobak[1] mentions the development of a follicular cyst after recovery from pelvic peritonitis. Rindfleisch[2] is inclined to attribute the non-rupture of the Graafian follicle to a deficient bursting-force in the majority of cases. He assumes that at the time of menstruation an expansible colloid material is produced by the cells of the membrana granulosa in the mature ovisac, which combines with the liquor folliculi, swells, and causes the rupture, just as the cranial bones are forced asunder when the skull-cavity is filled with dried peas and exposed to the action of water. Should too little of this colloid material be formed, the follicle would remain intact. According to Scanzoni,[3] this result may be caused by the imperfect congestion due to general hydræmia. Follicular cysts of the ovary are always of very slow growth, and, as a rule, give rise to few symptoms, their small size and benign course causing them to be overlooked. In the case of the larger multiple cystomata the invariable involvement of both ovaries is the only fact leading to operative interference. Spontaneous or traumatic rupture of the dropsical follicles may take place; in many cases, doubtless, a cure is thus effected. A variety of this form of cyst is caused by the degeneration of a corpus luteum, the point of rupture having closed. The original observations

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[1] *Wiener med. Presse,* 1872, No. 42.   [2] *Lehrbuch d. path. Gewebelehre,* S. 465.

[3] *Beiträge z. Geb. u. Gyn.,* Bd. v. S. 170.

of Rokitansky[1] on this point have since been confirmed by Schroeder and others.

Hemorrhage may take place into a Graafian follicle, forming blood-cysts ranging in size from a walnut to a man's fist (Leopold), while interstitial hæmatomata of any considerable size are much seldomer met with. The follicular apoplexy is probably due to blood-stasis occurring in the course of various disorders, or to the engorgement consequent upon torsion of the mesovarium or pedicle. Should such a follicle rupture, the hemorrhage into the peritoneal cavity may be so profuse as to occasion death. When the hemorrhage is interstitial the blood may infiltrate the entire stroma (Fig. 325).

FIG. 325.
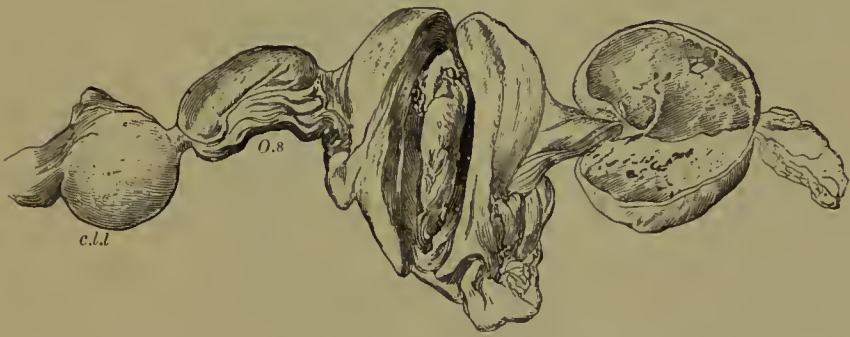
Hæmatoma of the Right Ovary succeeding scurvy, with polypoid hæmatoma of the uterus and left hæmatosalpinx : *O.s.*, left ovary ; *c.l.l.*, cyst of broad ligament (Olshausen).

The adenomata are new formations developed from the glandular constituents of the ovary, whether these be cell-nests, Graafian follicles, or tube-like epithelial structures ; but, though of frequent occurrence as the forerunners of cystomata, they are rarely observed in the pure, non-cystic form,[2] since their existence in that state is a very transient one. Inasmuch as its epithelium is of the cylindrical type, such a neoplasm is termed an *adenoma cylindro-cellulare*, from which, through the secondary dilatation of its saccules and tubules due to retained secretions, is developed the *adenoma cysticum*. Because of the fact that in the early stages of its development the adeno-cystoma is thus a purely glandular growth, it will readily be seen that should the specific fluid contents fail to be secreted, a pure adenoma cylindro-cellulare would be the result. Such a solid tumor is an extreme rarity ; indeed, but one well-authenticated case has thus far been recorded, and that by Schroeder.[3] The growth equalled in size the pregnant uterus at term,

[1] *Allgem. Wiener med. Zeit.*, 1859, No. 34.

[2] For descriptions of such adenomata consult the *Obstetrical Transactions*, vol. vi. pp. 181–183; Doran, *op. cit.*, pp. 32-34; Boettcher, *Arch. f. path. Anat. u. Phys.*, Bd. xlix. S. 306.

[3] "Handb. d. Krankh. d. weibl. Geschlechtsorgane," *Ziemssen's Handb. d. spec. Path. u. Therap.*, Bd. x. 1880, S. 360.

but all attempts to facilitate its removal in the usual manner failed, not a drop of fluid following the introduction of a large Veit's trocar ; subsequent examination revealed the fact that the tumor was quite solid, consisting only of adenomatous tissue, in which none but the minutest traces of cystoid degeneration could be detected.

Finally, the adenoma cysticum develops into the cystoma *par excellence*, as the retained cell-secretions increase in amount and ultimately become excessive.

From an anatomical point of view, as well as from the consideration of their genesis and clinical features, two leading varieties of the ovarian cystoma have within recent years been recognized : the proliferating glandular cystoma (*cystoma proliferum glandulare*), and the proliferating papillary cystoma (*cystoma proliferum papillare*), between which, however, there are various intermediate or mixed forms.

Proliferating Glandular Cystoma of the Ovary.

Synonyms.—Multilocular ovarian cyst, myxoid cystoma, multilocular colloid, compound cystoid, adenoma cylindro-cellulare cysticum, epithelioma mucoides.

As the simple follicular cysts which have just engaged our attention originate in the parenchymal zone only of the ovary, so do the common proliferating cystomata of the glandular type, inasmuch as their genesis may, in all probability, be referred to the glandular or germinal epithelium, either before or subsequent to the formation of the Graafian follicles. The vascular zone, on the other hand—and particularly that portion adjacent to the hilum, and in which the medullary strands of Kölliker are presumably best developed—is the customary seat of those multilocular proliferous cysts which are characterized by the exuberant papillomatous growths that beset their inner surfaces. (See Fig. 331 and Pl. IV., Fig. 4.) From this consideration of the topographical distribution of the ovarian cysts it becomes apparent why the development of the ordinary glandular cystoma should take place at the marked sacrifice of the organ's integrity. Seated in the free or intra-peritoneal portion of the ovary, the tumor in its growth forces the yielding tissues before it, rapidly destroying the normal contour of the gland and rendering uncertain in location the scattered remains of its normal parenchyma. In a large cystoma of this variety, therefore, the whole of the degenerated ovary is present, its outer wall being formed, in part at least, of the cystically distended ovarian stroma. Though occasionally sessile, such cysts generally possess a very distinct pedicle, the hilum, as a rule, remaining free from disease. Sometimes, however, as we have just intimated, a glandular cystoma invades the broad ligament ; that is, its development is extra- rather than intra-peritoneal, and it forms a ses-

sile tumor. Two instances of this comparatively rare condition are described by Doran.[1] Whether the anomalous mode of growth is to be attributed to the fact that the tumor originates at such an unusual depth in the substance of the ovary that the direction of least resistance is reversed, and whether it is due to secondary structural changes

FIG. 326.

A Proliferating Glandular Cystoma of the Ovary, slightly reduced from the natural size (Doran).

in the gland resulting from inflammation, etc., are questions not yet solved. It is probable, however, that the intra-ligamentous development of a glandular cyst may be determined by either condition. Of all ovarian tumors, the glandular cystoma is the most common and calls oftenest for surgical interference, as is strikingly shown by the experience of Doran. This author asserts that out of 605 cases of abdominal section performed in his presence for the relief of all diseased conditions demanding such treatment, 366 were operations for the removal of these growths.[2] In size they vary between the widest limits, their growth in extreme cases being determined only by the distensibility of the abdominal walls;[3] while their shape is usually irregularly spherical. The smaller and younger tumors, being largely composed of little cysts of a nearly uniform size, are usually more irregular and resistant than the larger ones, their firmness being due not only to the smallness of the loculi, but to the greater density of

[1] *Op. cit.*, p. 75. [2] *Ibid.*, p. 20.
[3] Kimball of Lowell (quoted by Peaslee, *Ovarian Tumors*, p. 37), in attempting the removal of an enormous proliferating cystoma, was forced to abandon the operation after drawing off one hundred and sixty pounds of fluid, though more than twenty pounds remained.

their contents as well. Instead of the whole, such parvilocular, honeycomb-like structures may form a part only of a cystoma; and in either case they often resemble on palpation a perfectly solid growth.

FIG. 327.
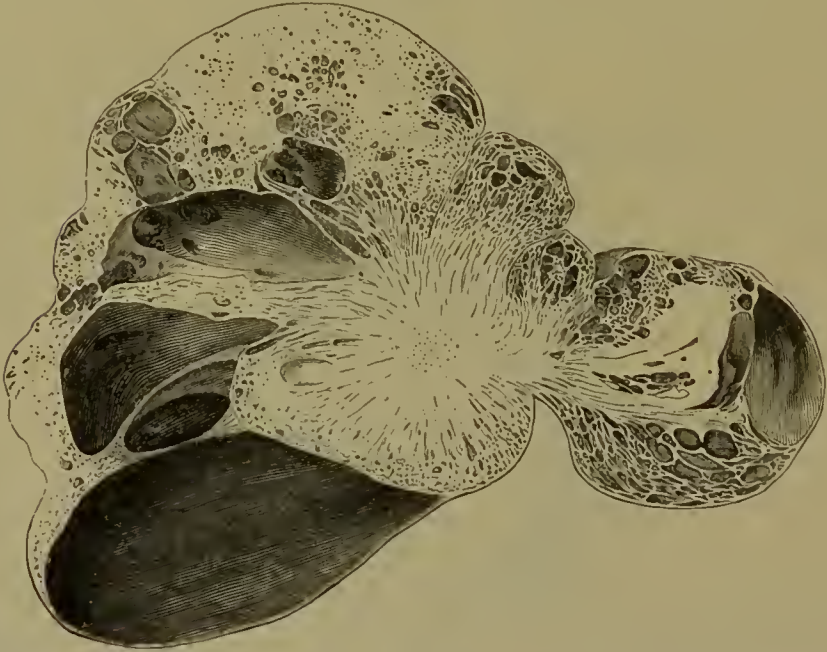
Section of an Ovarian Cystoma in the Process of Development, showing how the larger sacs are formed by the gradual confluence of the smaller loculi (reduced one-fifth).

Instead of these intra-cystic growths composed of fibrous stroma and tubular follicles, solid matter of a sarcomatous or carcinomatous nature may be present. As the tumor increases in size, one or more of the cysts develop more prominently than the others; and, inasmuch as their contents are usually thinner and of lower specific gravity than those of the smaller cysts, fluctuation will be evident, provided the distension be not too great, while percussion elicits a distinct thrill. The large cysts may be entirely independent, being separated from each other by thick partitions; usually, however, one main, principal, or primary cyst is present, in the interior of which are numbers of smaller, secondary ones. The secondary or "daughter"-cysts grow from the walls of the primary or "mother"-cyst, and tend to invade its interior, filling this completely at times. A single secondary loculus in its growth may entirely fill the primary cyst, by the repetition of which process the primary wall becomes markedly thickened. More frequently, however, the walls of contiguous cysts coalesce, undergo atrophy from mutual pressure, and finally rupture, the two interiors becoming thus united and forming a cavity resembling an hourglass in shape. The tendency of such a rupture in the septum between two

secondary cysts or loculi is to increase in size, by reason of the eccentric force exerted by the ever-increasing fluid contents, till, finally, not even a ridge-like projection marks the location of the original fused walls, every sign of the cystic union having disappeared. The manifold repetition of this process naturally results in the diminution of the number of loculi, unless the formation of new cysts keeps pace with their destruction; and thus the ovarian cystoma, which at first is always multilocular, tends to assume the paucilocular, and finally the unilocular, form. The remains of the secondary cyst-walls persist for a long time as narrow interlacing bands of white fibrous tissue, slightly raised above the inner surface of the main sac. Should a secondary loculus, forming an outgrowth from the inner wall of the main cyst, burst, its site is marked by an ulcer-like surface surrounded by the remains of its walls (Fig. 328). Occasionally the pressure exerted by the secondary cysts upon the wall of the main sac results in atrophy and rupture of the latter, followed by its retraction; in which case the daughter-cysts protrude, forming a tumor which might be likened to a pile of cannon-balls. Such a false exogenous cyst is of serious import, from its liability to form adhesions to the omentum and intestine, as well as from the facts that it is often filled with solid growths and is apt to rupture. Its recognition is facilitated by the appearance presented by the walls of the secondary sacs, these being thin

FIG. 328.

Ruptured Secondary Cyst, on the inner aspect of the main wall of an ovarian tumor, in the process of effacement (Doran).

and very vascular. The existence of the true form of exogenous cyst— that is, where the component sacs of a tumor have been independent from the start, and never included within a common wall— is attested by the experience of Mr. Thornton, related by Doran. By the same process as that which results in the union of two secondary cysts, multilocular cystomata affecting both ovaries may be joined together, forming the so-called *double* or *fused* cysts. In such a case, naturally, two pedicles would be present; and, should the situation be still further embarrassed by extensive pelvic adhesions, the difficulties confronting an operator may easily be understood.

The *wall* of the main sac in a typical multilocular cystoma is made up of fibrous tissue, the outer surface of which is covered with a simple layer of flattened cells, resembling those of the adjacent peritoneum and usually spoken of as endothelial; while upon the inner surface rests the lining epithelium of the cyst. The thickness of this fibrous coat varies greatly, being most marked in the neighborhood of the

pedicle, where three layers may generally be recognized: an external and internal of fibrous structure, and a middle stratum of loose connective tissue. As we recede from the peduncular attachment of the tumor, the middle coat becomes less and less distinct, and finally disappears, the external and internal coats blending into a single homogeneous fibrous membrane of comparative tenuity. When three lamellæ are present the arrangement of the blood-vessels supplying the cyst is as follows: the large arteries are found in the middle layer, their capillaries chiefly in the internal coat, immediately beneath the epithelial lining of the cyst, while most of the veins, which are large and muscular, are located in the external lamella.[1] As the pedicle is neared lymphatics of large size and abundantly supplied with valves accompany the vessels to the broad ligament. Nerves, too, have been found in the cyst-walls, though their ultimate distribution is not yet understood.

The *contents* of ovarian cysts of the glandular·variety vary between wide limits; indeed, there may be wellnigh as many fluids, possessed of quite different physical properties, as there are loculi in the tumor. As a rule, the fluid changes with the size of the cysts, being usually thin and watery in the very large ones, while in the smaller cavities it resembles strained honey, or even a dense semi-solid jelly, which cannot be evacuated through the canula, but requires rather the hands of the operator for its removal. As we shall see in a subsequent section, these changes in the physical characteristics of the cyst-contents depend upon alterations in the secreting epithelium. The color of the fluid ranges from light gray to black, the various shades being due to the presence of fat, pus, cholesterin, blood, etc. in variable amounts. The glandular cystomata are bilateral in about 3 to 4 per centum of the cases, and, as will be seen in a subsequent section, metastatic tumors resembling in structure the primary ovarian growth may be disseminated throughout the whole peritoneal cavity.

PROLIFERATING PAPILLARY CYSTOMA OF THE OVARY.

SYNONYMS.—Papillomatous ovarian cyst, multilocular ciliated cystoma.

Though Waldeyer, in his remarkable work on the ovarian tumors of epithelial origin,[2] distinguished the papillary from the glandular cystoma, he based this distinction merely upon the presence or absence

[1] Waldeyer, in his article on " Die Epithelialen Eierstocksgeschwülste, insbesondere die Kystome," *Arch. f. Gynäk.*, Bd. i. S. 252, denies that the distribution of vessels in the cystomata is at all peculiar; while W. Fox (*Med.-Chir. Trans.*, vol. xlviii. p. 227) refers to their spiral course as in the normal ovary.

[2] *Arch. f. Gynäk.*, Bd. i. 1870.

of intra-cystic papillary growths, evidently thinking that no further differences of an essential nature existed between the two forms. Some seven years later, however, Olshausen,[1] by virtue of his extensive clinical and operative experience, was enabled to claim for papillomatous cysts a more distinct position by showing that they differed from the glandular variety, not only anatomically, but clinically and genetically as well; and this view the labors of many more recent investigators have tended to sustain.[2] It is from the relics of the Wolffian body that these papillomatous growths are prone to develop; and hence they are met with in certain cysts, not only of the broad ligament, but of the ovary as well. As we know, some of the parovarian tubules are continued through the mesovarium into the vascular hilum of the ovary, where they form a branching network of so-called medullary strands, about the ultimate termination of which very little is known. But even if we are indisposed to accept the views of Kölliker, who would derive the cells of the membrana granulosa and discus proligerus from those of the medullary strands, it is certainly not unreasonable to suppose that scattered remains of the latter structures occur in the parenchymal zone, some of which may later give rise to papillary formations. Such an hypothesis explains most satisfactorily the occurrence of mixed cysts of the glandular and papillary types. The true papillary cystoma, however—in which the juicy glandular or adenomatous tissue of the cysts just described is replaced by exuberant, firm papillomatous growths—originates, as a rule, in the vascular hilum of the ovary, where the traces of the Wolffian tubules persist. Seated as it is, then, in the attached portion of the organ—in its stalk as it were—and developing in the direction of least resistance, such a cystoma proliferum papillare in its growth tends to invade the loose connective tissue between the folds of the broad ligament rather than the dense ovarian stroma, the free or intra-peritoneal portion of the genital gland being displaced, of course, but retaining its normal configuration till the tumor has attained considerable proportions. This condition is well illustrated by Fig. 329, which represents a tumor exceeding twelve inches in diameter. Indeed, each of the three forms of cysts thus far considered exhibits a different relationship to the ovary: the dropsical follicles protruding from the free surface of the organ; the glandular cysts causing its uniform enlargement; while, as we have just seen, papillary cystic disease of the ovarian hilum is long attended with simple displacement rather than disorganization of its more superficial parts. (See Fig. 321 and Pl. IV. Figs. 2 and 4.) A section through the wall of such a papillomatous hilum-cyst, so made as to include the ovary, is

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[1] *Vide* Olshausen: " Diseases of the Ovaries." *Cyclop. of Obstet. and Gyn.*, vol. viii.

[2] Compare Coblenz, *Virchow's Archiv*, Bd. lxxxii. H. 2, und Bd. lxxxiv. H. 1; also, Doran, *op. cit.*

well shown in Fig. 330. The mass of papillary growths (*pw*) springing from the base of the ovary is seen to include spaces (*is*), most of which are filled with the same dendritic structures. These spaces are

FIG. 329.
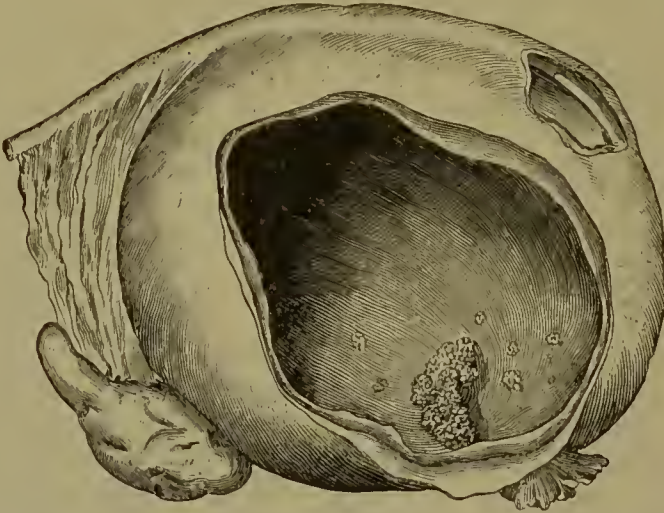
A Large Papillomatous Cyst springing from the Hilum of the Ovary, the greater part of which organ is not involved in the morbid growth. The cyst, which has forced its way between the layers of the broad ligament as far as the Fallopian tube, has had its outer surface and cavity exposed to view by the removal of portions of its serous envelope and wall (Doran).

either interpapillary, and formed by the coalescence of the free ends of the villous processes in the manner described by Fox,[1] Rindfleisch, and many others, or they represent cystic enlargements of the tubular Wolff-

FIG. 330.

Section through the ovary and Wall of a Papillomatous Cyst, showing the origin of the tumor in the hilum (natural size after hardening): *c*, cyst-wall; *ov*, ovary with dropsical ovisacs; *pe*, epithelial surface of ovary; *ds*, blood-vessels; *pw*, papillary growths; *is*, interpapillary spaces; *lr*, round ligament (Coblenz).

ian relics existing in that locality. Though true papillomatous cysts may resemble the ordinary glandular type in their intra-peritoneal

[1] Compare Wilson Fox: "On the Origin, Structure, and Mode of Development of the Cystic Tumors of the Ovary," *Med.-Chir. Trans.*, vol. xlvii., 1864.

development and in the possession of pedicles,[1] still such cases form
exceptions to the rule, and, as already intimated, may be genetically
ascribed to Wolffian remains in the parenchymal zone. As a usual
thing, however, the invasion of the broad ligament by a papillary cyst
keeps pace with its growth, the cyst becoming more and more sessile,
while the difficulties attending its removal generally increase *pari passu*
with its subserous development. When, in the course of an operation,
such a tumor is exposed to view, it presents some marked anatomical
peculiarities. The peritoneal folds of the ala vespertilionis are widely
separated, the upper border of the ligament presenting a broad convex
surface; while the normal serous reflections and pouches of the pelvic
roof are more or less completely obliterated on the affected side, the
serous covering of the tumor often merging into that of the iliac fossa
and fundus uteri without any sensible depressions. The uterus is
forced to the opposite side of the pelvis, and, as a rule, is more or less
elevated by the combined pressure and traction exerted by the growing
tumor. In case both ovaries are diseased, the upward displacement of
the uterus is more marked; indeed, the two tumors, which may occupy
the entire pelvic cavity, often conceal the intervening organ completely
by their apposition. But, unless the further expansion of the tumor
takes place at the entire expense of the anterior or posterior fold of the
broad ligament, it soon outgrows the intra-ligamentous space and in-
vades the underlying connective tissue of the cavum pelvis subperito-
neale (Luschka), where the available capacity of the pelvis may alone
determine its limits. Thus the tumor, displacing the bladder more or
less, and perhaps stripping the peritoneum from its base and summit,
may force its way into the subserous areolar tissue of the anterior
abdominal wall. Should laparotomy be attempted in such a case, the
peritoneum would be reached only after the removal of the intervening
cyst. In like manner, the recto-uterine and recto-vaginal spaces may
be invaded, the peritoneum of Douglas' cul-de-sac suffering an upward
displacement; or the tumor, passing more posteriorly, reaches the loose
retro-peritoneal tissue, and, continuing upward, comes to lie between
the large vessels in front of the spinal column and the intestines. In
some cases, indeed, the extra-peritoneal cystic growth forces apart the
folds of the mesentery, sigmoid mesocolon, or mesocæcum, and thus
comes into direct contact with the subserous structures of the small
intestine, sigmoid flexure, or cæcum and vermiform appendix respect-
ively. This extra-peritoneal development, which is a marked charac-
teristic of the papillary cystomata, occurs in the majority of cases, and
generally in the intra-ligamental space.

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[1] Doran (*op. cit.*, p. 71) mentions four cases of this kind, ascribing the anomalous
direction of growth to the fact that the papillary structures were in no instance either
abundant or exuberant.

The important anatomical feature of the papillomatous cysts, however, is the presence of villi or papillæ, in either simple or compound form, upon the inner surface of the cyst-wall, which resembles a mucous membrane in appearance. These outgrowths, ranging in height from one to two millimeters, may stud the entire surface or be limited to comparatively small areas of the lining membrane; and when of the villous type and closely set (villous growths of Fox), they form a smooth, velvety surface. Instead of this simple form, the growth may assume a most complex and intricate arrangement, the papillæ being very numerous, long, and branched, besides giving origin to secondary and tertiary offshoots resembling the placental tufts. In such a case, there being but a single layer of cubical or columnar epithelium investing its surface, the growth presents a branched, villous, or cauliflower appearance. Such dendritic aggregations of papillary vegetations form masses ranging from the size of a pea to that of a small apple, and project into the lumen of the cyst, their attachment to the cyst-wall being either pedunculate or sessile (Fig. 331). These

FIG. 331.
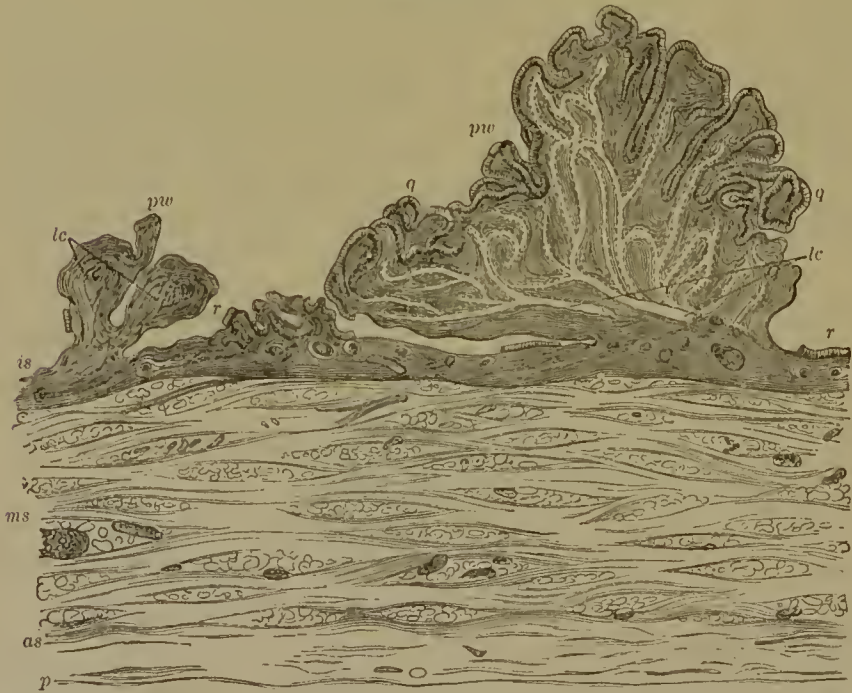
Section through the Wall of a Papillary Ovarian Cyst (enlarged fifty diameters): *p*, peritoneal coat; *as*, outer layer of the fibrous wall; *ms*, middle layer; *is*, inner layer; *pw*, papillary growths; *q*, transverse sections of papillæ; *lc*, empty capillaries; *r*, remains of epithelial lining (Coblenz).

papillomata consist of a connective-tissue stroma, often richly cellular, which is dense in the pedicle, looser in the free extremity of the growth, and affords support for blood-vessels of considerable size, branches of

which enter each of the component papillary processes and terminate in a single loop or in a fine capillary network. The entire papilloma is covered with a single layer of cylindrical epithelium, appearing as a beautiful mosaic of pentagonal and hexagonal cells, each of which contains a relatively large, round, and centrally disposed nucleus with its nucleolus. At the base of the growth its epithelial covering merges into that lining the cyst. Ciliated cells are found here and there upon the inner surface of the cyst; though, when small, the latter is frequently lined throughout with ciliated epithelium. This compound construction of the papilloma explains its doubtful position among the tumors, it being on the boundary-line between the epithelial and desmoid neoplasms. Those who regard the increase of the stroma as the essential feature in the tumor's growth class it among the connective tissue or histioid formations, while others consider the base subordinate to the cellular investment, and rank the papilloma with the other new formations of an epithelial type. The color of the papillary structures varies from pure white to dark red, or even black. Usually the papillæ contain numerous round or irregular-shaped concretions, *corpora arenacea*,[1] composed of the carbonate and phosphate of lime, which impart a gritty feeling on palpation, just as in the psammomata of the brain and its membranes. The calcareous deposits have a stratified appearance, and occur principally in the stroma, having no connection with the epithelium, but rather with the capillaries.[2] Forming in the immediate vicinity of the latter, probably in the perivascular lymph-spaces, they often cause the complete obliteration of the vessels, the terminal loops of which, however, are most apt to be thus affected. Though similar in structure to the papillary growths of the bladder and intestine, the intra-cystic papillomata are less prone to secondary ulceration and hemorrhage, probably because of their greater immunity from mechanical irritation. When handled during an operation, however, the soft, vascular growths bleed freely. Though distributed more sparsely, as a rule, over the inner surface of large cysts, the smaller loculi of a papillary cystoma may often be completely filled with these luxuriant dendritic growths, while both the secondary and main cyst-walls are frequently perforated by them. The papillomata in the latter instance tend to spread not only over the tumor itself, but over the adjacent serous surface as well, studding the bladder, uterus, and rectum, as well as the omenta and

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[1] Consult Coblenz, *Virchow's Archiv*, Bd. lxxxii. S. 273; Ackermann, "Carcinoma mammæ cum corporibus arenaceis," *ibid.*, Bd. xlv. S. 60; Kolisko, *Wiener med. Jahrb.*, 1884, H. 2 u. 3.

[2] From the fact that these psammomatous concretions occur in the cavities of cysts, and may entirely fill those of small size, Marchand ("Beiträge zur Kenntniss der Ovarientumoren," *Abhandl. d. naturf. Ges. zu Halle, a. S.*, Bd. xiv. H. 3) thinks them closely related to the epithelial structures.

abdominal viscera, and even appearing on the peritoneal covering of the diaphragm.[1] When psammomatous, these metastatic growths may be diagnosticated, even in the hidden recesses of the peritoneal cavity, by the sense of touch, a thickly-beset surface feeling like a grater. Thus the outer surface of the cyst may become the seat of tumor-like papillomatous growths of various sizes, which, as in the case of the inner surface, may be either sessile or pedunculated. This peculiar metastatic dissemination of the papillomata resembles that occasionally observed in the case of colloid cysts; the secondary growths in the latter instance constituting, as we have seen, the so-called *myxoma peritonei* (Netzel) or *pseudo-myxoma peritonei* (Werth). Instead of

Fig. 332.

Papillary Cystoma of the Ovary, with Perforating Papillomata (Olshausen).

thus appearing on the free surface of the cystoma, however, the papillomata may penetrate its wall beneath the peritoneum and extend into the surrounding connective tissue, or even invade the neighboring viscera. Thus the base of the tumor may become firmly attached to the pelvic floor, as well as to the bladder, uterus, or rectum.[2] Ascites frequently accompanies these tumors, particularly when the papillomatous growths invade the peritoneal lymph-space; and, should tapping be resorted to, the fluid, which represents the secretion of the epithelial cells covering the papillary deposits, quickly reaccumulates.

[1] *Vide* Doran: *op. cit.*, p. 70.   [2] Consult Klebs, *Handb. d. path. Anat.*, 1876, S. 797.

These clinical signs of malignancy, and the fact that death results from the general infection of the peritoneal cavity with papillomatous deposits, evidence a disposition on the part of the papillary structures to undergo cancerous degeneration, and have led to the employment of the terms "papillary carcinoma," "villous cancer," "epithelioma," and "cancroid" of the ovary. Macroscopically, the differentiation between the benign and malignant forms of papilloma ovarii is out of the question; though, in view of the fact that cancerous disease may be present, the rapid proliferation of the lining epithelium of a cyst would tend to arouse our suspicions. In doubtful cases, however, the microscope should be resorted to, the criterion of malignancy being the discovery of heterologous epithelium within the connective-tissue basis of the growths. This dual character of the cystoma proliferum papillare is well attested by the words of a leading ovariotomist,[1] who says: "But my most recent experience tends to show that there are two forms of papilloma associated with ovarian tumors—one malignant, and one not so. The latter speedily disappears after the removal of the tumor, and the patient gets quite well, though its naked-eye appearances are quite indistinguishable from those of the malignant kind. I have had two cases within the last year, aged fifty-seven and thirty-eight respectively, where I have left large masses of papilloma, fixing the uterus in both cases. Since the operations these masses have entirely disappeared, and the patients are both in perfect health." These papillomatous masses do not bear operative interference well; and, as a rule, the immediate consequences of their incomplete removal are seemingly more serious than those which would ensue were sarcomatous tissues to be left behind in the peritoneal cavity. Though sarcomatous disease of papillary cysts has been reported, the authenticity of the cases is doubtful (Coblenz). The papillary cystomata, which in 75 per cent. of the cases are bilateral, fail to attain the great size so often observed in the glandular variety, and have but few secondary loculi; while, instead of the thick colloid material which is so characteristic of the cystomata glandularia prolifera, the fluid within the papillomatous cysts is clear and free from glair. In addition to the clinical features upon which we have already dwelled, it must be stated that the latter tumors develop much more slowly than the former; though, in consequence of their extra-peritoneal growth, the symptoms due to pressure supervene both earlier and oftener than in the case of the multilocular colloid cysts. The practical conclusions which immediately suggest themselves from the foregoing are—first, that tapping and exploratory puncture of ovarian cysts are to be avoided; secondly, that their removal should be effected at as early a date as possible.

SUPERFICIAL OVARIAN PAPILLOMA.—The presence of papillomata

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[1] Tait: *op. cit.*, Amer. ed., p. 147.

upon the surface of the ovary is by no means a rare phenomenon, as we have seen ; though the growths are usually of secondary development, following the rupture of a pre-existing cyst of the ovarian hilum or broad ligament.   In a few instances, however, cauliflower excrescences, growing primarily from the ovarian surface and entirely distinct from intra-ovarian structures of like nature, have been reported.   Thus Coblenz describes a specimen of bilateral superficial papilloma removed from a multipara aged sixty-six years.[1]   Each ovary formed a tumor about the size of a goose-egg and contained a number of cysts, though the growths differed in this respect : while the whole free surface of the left genital gland was overgrown with papillary neoplasms, in the right these structures formed a zone which seemingly corresponded to the sero-mucous boundary-line of Waldeyer (Fig. 333).   The epithe-

FIG. 333.
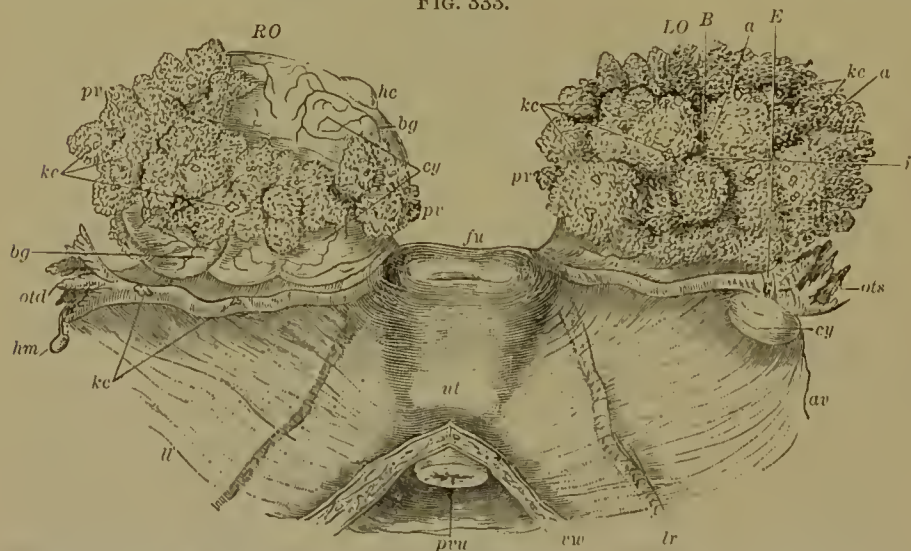
Superficial Papilloma involving both Ovaries (front view): *RO*, right ovary ; *LO*, left ovary ; *fu*, fundus uteri ; *hc*, hyaline cyst ; *pr*, papillary vegetations ; *cy*, cystic tumors ; *bg*, blood-vessels ; *hm*, hydatid of Morgagni ; *otd*, abdominal orifice of right tube ; *ots*, abdominal orifice of left tube ; *kc*, calcareous deposits ; *ll*, broad ligament ; *lr*, round ligament ; *av*, ala vespertilionis ; *ut*, uterus ; *pvu*, vaginal portion of uterus ; *vw*, vaginal wall laid open (Coblenz).

lial covering of the papillary apices consisted of long cylindrical cells, which gradually assumed a more cuboidal form on the pedicles of the cauliflower excrescences, to merge finally into the low germinal epithelium of the ovarian surface.   The presence of calcareous deposits in the papillæ imparted to the growths that peculiar gritty character of which we have already spoken.   A sagittal or transverse section of the left ovary passed through a number of cystic cavities, of which the largest represented a dropsical follicle, the smaller cysts being filled with dendritic growths (see Fig. 334).   As may be seen, the papillomata sprung from the surface of the ovary, having no connection with

[1] *Vide* Coblenz : *Virchow's Archiv*, Bd. lxxxii. S. 271.

the intra-cystic vegetations. Cross-sections of the ovaries in a similar case of bilateral papillomatous disease, described by Gusserow and Eberth,[1] disclosed nothing more noticeable than a few dilated and hemorrhagic Graafian follicles.[2]

Histologically speaking, as well as in their development and clinical features, these superficial papillomata ovarii resemble the similar structures found in ovarian cysts; and it is probable that in both instances their origin may be ascribed to cells (epithelial?) which are genetically identical. Why the growths should in rare cases be thus limited to the ovarian superficies is as yet unknown; though Olshausen, basing his views upon

Fig. 334.

Transverse Section of the Left Ovary (LO) represented in Fig. 333, the incision following the line δε (Coblenz): *hfg*, dropsical Graafian follicle; *cp*, cysts filled with papillary vegetations; *bs*, pedicles of papillomata; *is*, interpapillary spaces; *pv*, papillary vegetations.

recorded cases, is disposed to suggest as an etiological factor the irritating secretions of gonorrhœal salpingitis.

ETIOLOGY OF OVARIAN CYSTOMATA.—Unfortunately, but little is known as yet concerning the causes to which these proliferating forms of cystic disease of the ovaries may be imputed; and that little is of such a nature as to avail us nothing from a prophylactic standpoint. As a matter of fact, however, very little attention has been bestowed upon the subject, the operative, rather than the preventive, treatment of ovarian tumors in general having engrossed the professional mind since the advent of Listerism. The agencies which are usually regarded as taking a most active part in this connection may be classed as *predisposing* and *immediate* or *exciting*.

1. *Predisposing Causes.*—Chief among those mentioned under this head are age, chlorosis, the scrofulous diathesis, menstrual irregularities, marriage, parturition, sterility, and poverty. Of these, age has a most marked influence, the prevalence of the disease being greatest during the period of the most vigorous sexual activity, and rapidly diminishing as the extremes of life are approached. Thus the affection may occur as late as eighty or in early infancy. It was Doran's fortune, in examining the internal generative organs of a fœtus aged seven months, to discover in the left ovary three spherical cavities ranging from one-twelfth to one-sixteenth of an inch in diameter, each of which was lined with columnar epithelium and contained an abundance of dendritic growths identical with those found in post-natal cysts.

[1] "Grosse fibröse Papillome beider Ovarien," *Virchow's Archiv*, Bd. xliii.
[2] Compare Marchand, *op. cit.*; Birch-Hirschfeld, *Lehrb. d. path. Anat.*; J. Müller, *Ueber den feineren Bau und die Formen der krankhaften Geschwülste*, S. 541.

Within recent years another case has been described by Roemer,[1] in which a successful ovariotomy was performed upon a child twenty months old; while several others have been reported at an early age. The following table comprises 1713 cases observed by various authors:

61	cases	under	20	years.
440	"	between 20 and 30		"
499	"	" 30 and 40		"
371	"	" 40 and 50		"
342	"	over 50		"

The greater prevalence of the disease during the three decennial periods between the ages of twenty and fifty is shown by this table; though, aside from the fact that it is evidently most common after the age at which the majority of women marry, the causative influence of marriage is by no means demonstrated. Indeed, when the proportion of unmarried to married women is considered, a greater predisposition to ovarian tumors is, seemingly at least, exhibited by the former class. To what cause, then, may this increased ovarian disease of middle life be attributed? Largely, in all probability, to the effects of uninterrupted ovarian activity, this etiological factor becoming potent in the prime of menstrual life rather than in its earlier years, and affecting virgins as well as married women who have never borne children. When conception takes place ovulation ceases; and this ovarian repose, continuing throughout gestation and lactation, or a period ranging from eleven to twenty-one months, seems to act as a temporary safeguard against the occurrence of cystomata. "Thus," says Peaslee,[2] "it is the continuous ovarian activity of the never-parturient, and not the uterine activity with ovarian rest of the parturient, which becomes one of the most efficient of the predisposing causes of ovarian cystoma." In support of this view it may be added that out of 500 women afflicted with ovarian tumors, Boinet found 390 who had never given birth to children; while, according to Veit, the statistics of Lee, Scanzoni, and West show the proportion of sterile women to be 34 per centum. The observations of Scanzoni, Nussbaum, Olshausen, and Negroni,[3] however, apparently oppose this view. That parturition influences cystic degeneration of the ovaries seems hardly credible, when we consider the brevity of the process and the fact that it exerts no direct effect upon the ovaries. In the opinion of Clay, menorrhagia and amenorrhœa are largely responsible for these cystic growths, the latter of the two disorders being the more active. Other writers, again, believe that the disease is hereditary, and instances have been cited which seem to warrant the assumption. Thus, Olshausen states that

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[1] *Deutsche medicinische Wochenschrift*, 26ten Dec., 1883.
[2] *Ovarian Tumors*, 1872, p. 90.
[3] Comp. "Aperçu sur l'Ovariotomie," *Thèse de Paris*, 1866.

in three instances he has operated upon two sisters, removing in each of the six cases a unilateral cystoma of the proliferating type. Rose has also observed the disease in two sisters whose maternal aunt was similarly afflicted; Simpson, in three sisters; while another author describes seven fatal cases occurring in one family.[1] That the connection between chlorosis and ovarian cysts is one of cause and effect, in the opinion of Scanzoni, we have already seen; and this view sheds some light upon the following statements by one of the most successful and experienced of ovariotomists, which otherwise sound somewhat paradoxical:[2] " Les femmes lymphatiques et nerveuses sont très sujettes aux kystes de toutes sortes. Dans les régions géographiques où le temperament sanguin prédomine, les kystes de l'ovaire sont rare." That poverty, with its depressing consequences, predisposes its victims to the disease must, in Thomas' opinion, have become evident to every one of large experience.

2. *Exciting Causes.*—Considerable speculation concerning the immediate causes of cystoma ovarii has been indulged in, but, in the absence of convincing proofs, it has availed little, and our knowledge of this subject is even less satisfactory than of that just considered. Oöphoritis, direct violence, sexual excess, unsatisfied longings of a libidinous character, suppression of the menses, and other influences which might *a priori* be regarded as likely to excite this disease, have been adduced as etiological factors; while, in the production of the compound cystoma, the irritation due to a primary dermoid cyst has, within recent years, been assigned a prominent place. Hyperæmia and inflammation have been suggested as exciting causes by Scanzoni and Kiwisch respectively; but, though instances are on record in which cystomata have made their appearance after menstrual disorders or severe pain in the ovarian region, suggesting congestion and ovaritis, they are rare and do little to substantiate these views. Indeed, if the disease were to be ascribed to these causes it would certainly affect the left more frequently than the right ovary; since, for reasons of a purely mechanical nature, the former is decidedly more prone to hyperæmia and inflammation (Peaslee) than is the latter. This is due to the fact that while the right ovarian vein is supplied with a perfect valve at the point where it joins the vena cava, no such valve exists on the left side from its origin to its termination in the left renal vein. The similar anatomical construction of the analogous spermatic veins of the male accounts for the much greater frequency of varicocele on the left side than on the right. In point of fact, however, statistics seem to disclose a condition of things quite the reverse of that which mere theoretical reasoning would lead us to expect; and if any difference actually exists between the ovaries in

[1] *Vide* Lever: *Guy's Hospital Reports*, vol. i. p. 79.
[2] Koeberlé, *Les Maladies des Ovaires*, Paris, 1878.

respect to their liability to undergo cystic degeneration, it is in favor of the right. Thus, Clay found that of 850 cases of ovarian cysts examined by him, two-thirds were located on the right side, the balance on the left; while Tilt,[1] out of a total of 475 cases, observed the disease 260 times in the right ovary, 170 times in the left, and 45 times in both. Chéreau, Lee, Scanzoni, and Bloff also furnish statistics which support this view, 204 of the 403 cases of cystic tumors reported by them affecting the right ovary alone, 149 the left, while in 50 instances the disease was bilateral. These figures are the results of observations made during life, and, though confirmed in several instances by quite extensive post-mortem records, such confirmation has been but partial—a fact which seemingly justifies the inference that in all probability the actual difference between the ovaries in this respect is very slight.

HISTOGENESIS AND DEVELOPMENT OF OVARIAN CYSTS. — A chronicle of the results attending the laborious efforts of a long list of patient investigators, whose self-imposed task has been to trace back to its very beginning the formation of ovarian cysts, would disclose the fact that the subject is apparently in a less satisfactory condition now than in the early part of the present century; the idea that all cysts were developed from Graafian follicles, which then obtained, being supplanted by the numerous, and oftentimes antagonistic, views of to-day. Virchow[2] was the first to distinguish between hydrops follicularis and the proliferating cystoma, claiming that the latter originated in a colloid degeneration of the ovarian stroma rather than from the epithelial elements of the gland; in which view he has been supported by Förster, Klob, and, in part at least, by Mayweg.[3] According to Förster, the connective-tissue corpuscles of the ovary proliferate and form aggregations of embryonal-like cells, the most internal of which undergo colloid degeneration and are destroyed, while those more peripherally disposed remain and constitute the epithelial lining of the cystic cavity. Of the three varieties of ovarian cystoids—that is, tumors composed of one or more cysts—recognized by Rindfleisch,[4] he ascribes the origin of two to the Graafian follicles, while the third (colloid cyst-adenoma) is, in his estimation, to be likewise referred to this colloid metamorphosis of the ovarian tissue. Sections cut from the more solid portions of a cystoma belonging to the last-mentioned group, whether they were taken from its outer investment or represented a portion of the internal framework of the tumor, were rarely found to present a uniform, unbroken surface of well-organized con-

[1] *The Lancet*, Dec., 1849; Feb. and March, 1850.
[2] " Das Eierstockscolloid," *Verhandl. d. Ges. f. Geb. in Berlin*, Bd. iii., 1848, S. 197.
[3] Consult Förster, *Lehrb. d. path. Anat.;* Klob, *Path. Anat. d. weibl. Sexualorg.*, 1864; Mayweg, " Entwickelungsgeschichte der Cystengeschwülste des Eierstocks," *Dissert. inaug.*, Bonn, 1868.
[4] *Op. cit.*, p. 470.

nective tissue, cysts of various sizes appearing, the most minute of
which required the microscope for their detection. The lumina of the
smaller cysts were traversed here and there by delicate connective-
tissue fibres, no special wall or epithelial lining being perceptible.
Such a section is shown in the accompanying Fig. 335. It will be
observed that groups of small, round cells (*e*), suggesting inflamma-

Fig. 335.

Colloid Degeneration of the Stroma in an Ovarian Cystoma (Rindfleisch): *a*, larger cysts, par-
tially lined with low cylindrical epithelium, and with radial cleavage of their contents due
to hardening; *b*, more recent cyst, without epithelium, and traversed by fibres of connec-
tive tissue; *c*, the same, containing a row of detached epithelial cells; *d*, colloid infiltration
of the connective tissue, from which a cyst has not yet developed; *e*, infiltration of the
stroma with small cells. (Enlarged 200 times.)

tory irritation, appear in the stroma; and Rindfleisch is undecided
whether to attribute the genesis of the cysts primarily to the colloid
degeneration of these cells or of the connective tissue itself. The epi-
thelial lining of the cystic cavities is formed later. Doran describes
similar cavities, which under an inch objective appeared like foci of
colloid degeneration; while a high power disclosed the presence of a
lining made up of long, cylindrical epithelial cells. Connective-tissue
processes extended into the cystic cavities, crossing in some instances
from wall to wall. Such appearances have often been mistaken for
colloid degeneration of the stroma; though Doran is disposed to regard
them as obstructed diverticula of the larger cysts, the epithelium in
both being similar. These facts show the necessity of distinguishing
extra- from intra-follicular colloid growths.

Not only does the colloid metamorphosis manifest itself in the

stroma, follicles, and corpora lutea, according to various pathologists, but the walls of the large blood-vessels in the ovary may likewise undergo this peculiar degeneration. It was Noeggerath who first suggested that disease of the latter structures might terminate in the formation of ovarian cysts.[1] This observer, in his studies of ovarian tissue, met with peculiar branched structures which he recognized as altered and enlarged blood-vessels, and which bore a striking resemblance to the tubes of Pflüger as depicted by Waldeyer (see Fig. 320); indeed, it required but a slight exercise of the imagination (as Noeggerath expresses it) to convince one of the identity of the two formations. The changes in the blood-vessels which were supposed to be the result of an endoarteritis destruens consisted in hyperplasia of the middle coat with atrophy of the tunica intima, the muscle-fibres of the arterial wall becoming metamorphosed into epithelioid cells, and, later, into true cylindrical epithelium. Thus the cyst, occupying the distended lumen of the diseased vessel, derived its cellular lining from the muscular coat, or possibly from the altered endothelium. According to Noeggerath, many cysts of the adenoma-cylindro-cellulare type possess this angiomatous genesis, and thus merit the designation "angiomata cystica."

The views concerning the histogenesis of ovarian cystomata thus far considered, and to which the theory of Noeggerath is allied, are, as we have seen, directed to the dermoid or connective-tissue portion of the gland as the starting-point of the disease ; but, on the other hand, the great majority of more recent writers favor its purely epithelial origin, though differing as to the precise nature and condition of the parenchymatous structure to which such origin may be ascribed. Among those who regard the Graafian follicles as the sole starting-point of the cysts are Ritchie, Wells, Tait, Doran, and Fernbach.[2] In Tait's opinion ovarian cystomata are the result of follicular dropsy only ; but what determines the special type of tumor thus formed ? Why should a proliferous cyst rather than a multiple cystoma be produced by the operation of the same cause ? The answer to these queries has been sought in the anatomical distinctions which exist between the two growths. In the loculi of Rokitansky's tumor, or the multiple cystoma, ova are found, and the epithelium does not differ from that lining the Graafian follicle ; while in the proliferating cystoma the ovules are absent, and the epithelium has undergone marked changes. As De Sinéty and Malassez remark : "The epithelium in these new formations shows every possible variety ; but in none, not even those which simulate the Graafian follicles, have we found any epithelium similar to that of the follicles, neither have we ever found any ovules in their interior." While these authors are

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[1] Noeggerath on "The Diseases of the Blood-vessels of the Ovary in Relation to the Genesis of Ovarian Cysts," *Amer. Journ. of Obstet.*, vol. xiii. 1880.

[2] "Ueber die Genese der Eierstockseysten," *Dissert. inaug.*, Breslau, 1867.

disposed to attribute this destruction of the ovum and the epithelial transformation to the excessive dilatation of the follicle, Tait claims that in so doing they are probably substituting the cause for the effect; the changes, and particularly those affecting the epithelium, being the occasion, rather than the result, of the cystic enlargement. Whether the epithelial changes follow or precede the destruction of the ovum is not yet definitely determined; though the tendency of those who refer the origin of ovarian cysts to the mature follicles is evidently to favor the former view, they believing that the follicular epithelium returns secondarily to the young, immature, or fœtal type, in which the tendency to proliferate is so marked. The development of ovarian cysts from the dilated Graafian vesicles is simply and attractively explained by Tait, who cites in support of his theory, and by way of illustration, the phenomena attending soap-bubble blowing. " If the fluid be not viscid enough to enable the cells to retain their form," says that writer on ovarian diseases, " then the normal condition of the ovary is represented, its cells bursting and disappearing. Let us suppose that the cell-growth is constantly going on, and that some alteration occurs in the state of matters which prevents the cell-walls bursting; the fluid in the basin is so viscid that the cells do not break, and bubble after bubble is formed, some larger, some smaller, until a large multicystic tumor is the result. The actual appearance of the cystic ovary may be very well imitated in the basin of soapsuds. A large cyst can be made with little ones crowding into it, looking like its offspring, and the walls between two or three may be broken down, making one larger multilocular tumor—the remains of the intervening walls not being left in the instance of the soap-bubbles. . . . . In the ovary we have the continual production of cells, representing the continuous blowing of the bubbles; and we have only to discover what it is that is analogous in the ovary to the increased viscidity in the solution of soap—what it is that keeps the cysts in their entirety, perverting a physiological into a pathological process." The conclusion at which Doran arrives as the outcome of repeated painstaking examinations of human ovaries—fœtal, infantile, and adult—refer the origin of multilocular cysts to the ovisacs also, it is true, but to those which have undergone partial atrophy; indeed, this author avers that evidence is strongly opposed to the theory which would ascribe even the occasional genesis of the disease to dilated mature follicles. Instead of completing the physiological cycle and forming corpora lutea of menstruation or pregnancy, many of the follicles fail to ripen, development giving place to a retrograde metamorphosis marked by atrophy. The ultimate result of the atrophic process would be the formation of dense, cicatricial, semi-opaque bodies called corpora fibrosa;[1] and even these

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[1] *Vide* Patenko: "Ueber die Entwicklung der Corpora fibrosa in Ovarien," *Virchow's*

may disappear later, leaving no trace of the original ovisacs. Doran believes that in some cases this atrophy is interrupted by certain unknown influences, and that the follicular epithelium, provided any has survived the preceding retrograde process, then proliferates exuberantly. The supervention of colloid degeneration in the newly-formed epithelial cells accounts for the intra-follicular colloid deposits, which Doran recognizes as the early stages of cystic disease. The secondary loculi of cystic adenoma and papilloma also result from the proliferation of the epithelial lining of these single cysts, according to Doran, the process being identical with that which we are about to describe. Still another theory has been propounded by Waldeyer[1] and Klebs to account for the formation of the proliferating cystomata, which concerns the tube-like collections of germinal epithelium within the ovarian stroma, first described by Pflüger (see Fig. 320), and destined to develop later into Graafian follicles. Thus, instead of attributing the origin of these ovarian cysts to ovisacs already formed and in either a mature or undeveloped state, as do the authors just considered, Waldeyer goes back still farther in the life-history of the intra-ovarian germ-epithelium—to the ante-follicular period, in fact, when the tendency to proliferate and form abnormal growths is even more marked. The formation of the primary cyst is ushered in by the appearance of a space in one of the masses of germinal epithelium constituting the tubes of Pflüger; which space is apparently formed by a dilatation of its lumen. At the same time the surrounding cells, forming the wall of the cyst, begin to proliferate much more rapidly than would suffice to merely line the growing cystic cavity, and, after the manner of secreting membranes in general, which undergo extension by inversion or recession, invade the cyst-wall in the form of small, gland-like tubes resembling those of the uterus and having either blind or inosculating extremities. These tubes, which are perpendicular to the inner surface of the primary cyst, pursue a straight course usually, though they may divide dichotomously. Transverse sections of such a cyst-wall resemble those of the intestines or stomach, where the tubular outgrowths of epithelium are numerous and close together; though, as their distribution over the surface of the cyst is irregular, these processes may in places be few in number and widely separated. The epithelium of these glandular formations, as well as of the parent-cyst, degenerates into or secretes the peculiar colloid material which is so characteristic of the cystoma proliferum glandulare; and, should the mouths of the tubes become occluded by pressure, actual fusion, or because of the

Archiv, Bd. lxxxiv. S. 193; also Beigel, "Zur Naturgeschichte des Corpus Luteum," *Archiv für Gynäkologie*, Bd. xiii., 1878.

[1] "Die Epithelialen Eierstocksgeschwülste, insbesondere die Kystome," *Arch. f. Gynäk.*, Bd. i. S. 252.

density of the fluid, they are converted into cysts. Thus retention-cysts develop in the wall of the mother-cyst. From the inner surfaces of these secondary loculi, tertiary are formed in the same manner; and thus the process may be repeated *ad infinitum*, resulting in the formation of a proliferating cystoma having a multitude of compartments (Fig. 336). Further alterations in the tumor, as we have seen in a previous section, are largely the result of the coalescence of these secondary cysts, mutual pressure causing the atrophy and disappearance of their contiguous walls, with the final production of one or more cavities of large size.

FIG. 336.

Section of the Wall of a Proliferating Glandular Cystoma (enlarged about 30 times): *a*, outer fibrous layer; *b*, inner cellular layer, covered with cylindrical epithelium; *c*, larger glandular tubes; *d*, small, very recent, tube-like structures; *e*, small secondary cysts; *f*, glandular tube with cystic enlargement of lower end; *g*, glandular tube with forked extremity (Waldeyer).

While this cystic proliferation is the result of the energetic growth of the epithelium, it is accompanied with hyperplasia of the stroma, sufficient at least to provide a proper investment of connective tissue for the tubular offshoots of epithelium, as well as for their cystic enlargements. Instead of, or in addition to, these glandular processes, papillæ and variously shaped papillomatous excrescences may appear within a cyst, besetting a part or even the whole of its surface, and being in some instances of such exuberant growth as not only to completely fill the interior, but to perforate the wall of the sac as well. When these papillomatous, rather than the glandular, growths predominate in a neoplasm, Waldeyer distinguishes it as a "proliferating papillary cystoma." Whether the papillary structures owe their origin to

the inward proliferation of the epithelium, accompanied perforce with
its matrix (Fritsch), to the primary hyperplastic development of the
stroma, forcing before it the epithelial lining of the cyst (Waldeyer),
or whether they represent the passive results of adjacent gland-forma-
tions (Boettcher),[1] are questions of secondary importance. In any case,
the formation of secondary cysts is probably due to the coalescence of
the free ends of the papillary excrescences, as described by Fox,[2] the
closed interpapillary spaces thus formed becoming filled with the col-
loid secretion of the epithelial cells. The development of secondary
cysts from both the papillary and glandular formations is well illus-
trated in the accompanying wood-cut (Fig. 337). Waldeyer's view of

FIG. 337.

Schematic Diagram illustrating the Development of an Ovarian Cystoma (Fritsch): *a*, lining
of cylindrical epithelium; *b*, fibrillar connective tissue of cyst-wall; *c*, germ-epithelium; *d*,
blood-vessels; *e, h*, two interpapillary cysts united by pressure-atrophy of intervening sep-
tum; *h*, cyst formed by cohesion of papillary extremities and colloid degeneration of epi-
thelium; *i*, glandular tubes formed by recession of proliferating epithelium; *k*, papilloma-
tous mass which has perforated the cyst-wall, *n* and *o* representing the intra- and extra-cystic
portions respectively; *l*, branched adenomatous recess, due to epithelial proliferation; *m*,
incipient interpapillary cyst; *g*, secondary cyst at a more advanced stage than *h*.

the histogenesis of ovarian cystomata is supported by De Sinéty and
Malassez, who refer the beginning of many cysts to tubular ingrowths
of germinal epithelium, either normal or pathological (*enfoncements
pathologiques*), which they regard as the precursors of Pflüger's tubes.
    It was assumed by Pflüger himself that the egg-tubules were not

[1] "Beob. über die Entwick. multiloc. Eierstockscysten," *Virchow's Archiv*, Bd. xlix.
S. 298.
[2] *Vide* Wilson Fox: "Cystic Tumors of the Ovary," *Trans. Roy. Med.-Chir. Soc.*, 1864.

merely a feature of the fœtal ovary, but that they continued to form in later life; and the fact that these structures have been discovered in the ovaries of children and adults by Spiegelberg, Köster, Langhans, and others, together with the marked prevalence of the cystomata during adult life, would seem to warrant Olshausen's assumption that the development of these growths may begin at any period of life, and then from newly-formed tubules. However, such an explanation seems superfluous. We know absolutely that ovarian cysts, in either a rudimentary or advanced state, have been observed in the fœtus; and should the tubes of Pflüger fail to undergo the normal conversion into follicles during the intra-uterine or early infantile stages, their persistence in later life would account for the subsequent development of the cystomata. Indeed, the very influences determining such a persistence of the egg-tubes might prove potent factors in effecting their cystic degeneration. Of the various theories which we have just considered respecting the histogenesis of these cystic growths, it is probable that all are to some extent true; though the burden of evidence certainly seems to be in favor of their development from fœtal structures in the majority of cases. In support of the view first advanced by Olshausen, that papillomatous cysts arise from the parovarian structures within the ovary, and are therefore genetically distinct from the glandular variety, we have the testimony of Doran. This observer has in several instances met with papillary cystomata springing from the medullary strands in the ovarian hilum, and resulting in the displacement, rather than in the invasion, of the glands, the normal outlines of which were preserved. In the left ovary of a seven-month fœtus also Harris and Doran[1] found a row of three cysts, varying in diameter from one-twelfth to one-sixteenth of an inch, filled with characteristic papillomatous growths, and traceable, genetically, to the Wolffian structures. Fischel[2] also indorses this view, though in a modified form, by referring the origin of these papillary cysts to the cells of the membrana granulosa, which, with Kölliker, he believes to be of Wolffian origin. According to Marchand[3] and Flaischlen,[4] on the other hand, both the papillary and glandular cystomata originate in the germ-epithelium, though differing in their subsequent development. This latter view, however, is far from being satisfactory, inasmuch as it does not account for the increased malignance, extra-peritoneal development, and bilateral occurrence of the papillary cysts. A strict separation of the two varieties of proliferating cystic tumors is hardly possible, however, since in exceptional cases papillomatous and glandular structures coexist in the same multilocular growth, and even

[1] "The Ovary in Incipient Cystic Disease," *Journ. of Anat. and Phys.*, vol. xv.
[2] "Ueber Parovarialcysten und parovarielle Kystome," *Arch. f. Gynäk.*, Bd. xv.
[3] *Op. cit.*   [4] *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. und vii.

in the same loculus, together, it may be, with various forms of degeneration, including the cancerous.

THE WALLS OF THE CYSTOMATA.—When exposed to view in the course of a laparotomy, the main wall of a typical multilocular cystoma usually presents a smooth, glistening surface of almost silvery whiteness; though this appearance is altered at points where secondary cysts have developed within the wall, or where inflammatory and other changes of a degenerative character have taken place. Such a wall, varying in thickness from one-fourth to ten millimeters, is made up principally of fibrous tissue, the outer and inner surfaces of which are bounded by the peritoneal and epithelial layers respectively. The middle or proper layer has been divided into from one to six laminæ by different observers, the number depending upon the skill of the dissector rather than upon definite anatomical distinctions. The wall being thinnest at a point opposite the peduncular attachment of the cyst, and thickest in the latter situation, the ease with which the above separation can be effected increases as the pedicle is approached. When three lamellæ can be demonstrated, the middle one is found to be made up of loose connective tissue, while the outer and inner layers are of a denser fibrous structure. The large arteries supplying the cyst-wall are found in the middle layer, and distribute their capillaries principally to the subepithelial stratum. The veins, which may reach the size of one's little finger,[1] mainly occupy the outer stratum. Smooth muscle-fibres also occur in abundance, especially near the pedicle and in the neighborhood of the blood-vessels; while nerves and lymphatic vessels ramify throughout the walls, the latter being of considerable size and well valved in the pedicle. According to Waldeyer, the main wall and those of the larger secondary cysts possess two layers: an external one, composed of dense connective tissue, having parallel fibres and containing but few cells; and a much thinner internal one, rich in cells and blood-vessels, upon which rests the epithelial lining of the cyst.[2] (See Fig. 336.) These layers correspond to the tunica fibrosa and tunica propria of the larger ovisacs, while the epithelium may be compared with the membrana granulosa. In smaller cysts the tunica propria alone is present, just as in the early stage of a Graafian follicle. Oftentimes the tunica externa may be subdivided into several layers separated by loose connective tissue, and of these the inner are always more cellular than the outer.

The epithelial lining of the cysts is composed almost invariably of columnar cells; though in consequence, probably, of the eccentric pressure exerted by the fluid contents, these approach the pavement type in the larger sacs. Ciliated cells have also been observed. As a rule,

[1] *Vide* T. S. Lee: *Tumors of the Uterus*, p. 13, London, 1847.
[2] *Vide* Waldeyer: *Archiv f. Gynäk.*, Bd. i. S. 252.

but a single epithelial layer is present; Boettcher, however, describes the occurrence of several superimposed strata. When in a fresh state the epithelium appears as a delicate mosaic, of which the individual cells are distinguished almost solely by their beautiful vesicular nuclei, while the nucleoli are small and often wanting altogether. The protoplasm of the cells, besides being quite pale and of a finely granular character, is very soft, resembling the adjacent colloid; while the borders of the cells are disclosed by the action of acetic acid. The nuclei occupy the lower or attached ends of the cells, and the protoplasm immediately surrounding them is darker and more coarsely granular than in the free ends (Fig. 338). This deep, perinuclear protoplasm takes

FIG. 338.

Portion of the Internal Wall of a Glandular Cystoma (enlarged 300 times): *a*, colloid mass; *b*, cylindrical epithelial cells, the free ends of which are open; *c*, innermost layer of connective-tissue substratum (Waldeyer).

with carmine a much more intense stain than does that more superficially disposed, the latter often remaining clear and exhibiting a homogeneous mucus-like nature, resembling the colloid contents of the cysts. In sections of preparations which have been hardened in alcohol the boundaries of the cells always show, while the upper ends seem to be open. Thus the cells may resemble long, narrow goblets (beaker- or chalice-cells). Frequently these goblet-cells are of the ordinary form, having markedly swollen bodies and homogeneous mucous contents. The epithelial investment of the ovary terminates in a white, irregular, and somewhat elevated line, which encircles the base of the gland and marks the boundary between epithelium and serous membrane. Accordingly, should a small tumor develop on the distal side of the boundary-line and enlarge at the entire expense of the ovary, it will be seen that its outer surface would be covered with a layer of germ-epithelium. As a matter of fact, however, the cystomata in their growth practically displace the ovary, or they expand in a forward direction, invading the broad ligament and becoming extra-peritoneal. In either case the outer surface of the tumor is almost completely invested by the peritoneum, this membrane being always replaced at some point, however, by the low columnar or cubical epithelium of the distended and flattened ovary. The site of the ovary usually occupies the upper and anterior portion of the cyst-wall, and is differentiated from the surrounding serous membrane by its lighter color and diminished vascularity. At times, however, a few anasto-

mosing blood-vessels, radiating from the surrounding peritoneum, are observed coursing over this ovarian area.

Upon the surface of ovarian cysts, which in other respects are quite healthy, there may usually be seen numerous patches of a red color, due to the ectatic condition of the blood-vessels, besides smaller areas, denuded of their epithelium and presenting a comparatively blue and dull appearance. Small pedunculated outgrowths from the main wall have been observed by Doran at points considerably removed from the pedicle of the tumor; and the same author also directs attention to thin-walled cysts of inconsiderable size and lined with endothelium, which, forming in the cyst-wall, appear externally as rounded protuberances. These are the homologues of similar cysts of intra-ligamentous development. Of these excrescences on the outer surface of the cystomata De Sinéty and Malassez lay special stress upon two varieties—the "connective-tissue" and "mixed" types. The connective-tissue growths are of frequent occurrence, and appear either in the form of flattened, elevated, opaque patches of dense fibrous tissue, or as small, discrete nodules of young connective tissue, mixed with cysts of minute size. The writer also has had occasion to examine growths of the latter variety. The "mixed" growths of these French authors frequently appear as small, red, fleshy caruncles or wattles, which are covered with low cubical epithelium and resemble strongly the fimbriæ of the Fallopian tube; indeed, the assumption that they are developed from the laciniæ is supported by the fact that ciliated epithelium has occasionally been found upon them. Distinct from all these are the papillæ and papillomatous masses, which have already been sufficiently described. Waldeyer states that the round and often terraced depressions or erosions which are sometimes found on the wall of the main cyst, and particularly on its anterior aspect, are to be regarded as the effects of friction between the neoplasm and the abdominal parietes.

Among the secondary changes of a retrogressive nature to which the walls of an ovarian cystoma are exposed may be mentioned the following: fatty degeneration, calcification, ossification, atheroma, and infarctions. Of these, the first is probably invariably present, though varying in degree, and is characterized by the direct metamorphosis of the albuminoid constituents of the tissues into fatty material, the result being the destruction of the histological elements and the softening of the intercellular substance. Both the epithelium and the connective tissue of the walls are affected, their softening and dissolution being followed by the appearance of fat and cholesterin in the fluid contents of the cysts. This retrograde change is favored by intra-cystic pressure, torsion of the pedicle, disordered conditions of the blood, and such other causes as interfere with the nutrition of the cyst-walls. Calcification affects the inner stratum of the main wall chiefly, the

lime-salts being deposited in the form of granules or laminæ, which are generally separated from the epithelial lining by a thin layer of connective tissue. The rapidity with which this calcareous infiltration of the diseased tissues is effected varies with the nutrition of the growth, and may become very marked in cases where this is interfered with; indeed, in a case of torsion of the pedicle, reported by Leopold, the tumor, which was as large as an orange, had undergone almost complete calcification. Occasionally, true bone is found in the walls of ovarian cysts, such a heterologous growth being due to simple metaplasia of the pre-existing fibrous tissue.[1] Atheroma affects the inner layers of the cyst-wall principally, and usually results in the destruction of the epithelium lining the diseased areas. The so-called infarctions observed by De Sinéty and Malassez in the septa of ovarian cysts consisted of whitish, opaque patches, each of which was invested by a red zone of hyperæmic tissue, and made up of granular matter, connective-tissue fibrils, white blood-globules, and other cells.

THE CONTENTS OF OVARIAN CYSTOMATA.—Every glandular secretion is, in general, composed of two parts: a simple transudate, contributed directly by the vascular system, and certain special ingredients, selected or elaborated from the blood by the cells, which are the chief agents in the process. The cells yield up their contents in the form of an exudation, or the fulfillment of this special function involves their own immediate construction, since in the latter instance they either burst or become detached in an entire state from the basement membrane. Upon the nature and amount of the material thus supplied by the cells depends the special character of the secretion. In the cystomata resulting from the atypical proliferation of the glandular epithelium of the ovary, likewise, the peculiar contents of the sacs are largely the production of the lining cells, and represent the products of their degeneration. The epithelial cells either undergo *in toto* a colloid, myxoid, or paralbuminoid metamorphosis, or only a part of their protoplasm is for a time so changed (goblet-cell form). In the latter case it is probable that each of the goblet- or beaker-cells acts for a time as a minute unicellular gland before perishing. Under the microscope the intra-cystic colloid material is seen to be continuous with that within the goblet-cells—a fact which demonstrates its cellular origin. (See Fig. 338.) This metamorphosed protoplasm of the epithelial cells, when liberated, swells in the vascular transudate, and either dissolves or remains suspended in the form of a fine emulsion, its amount determining the density of the resulting fluid. That the epithelial cells are thereby sacrificed is proved by the fact that they occur in the colloid substance, either in a whole state as round, bright, vesicular

[1] *Vide* Fürst: "Knochenneubildung in der Wand einer Ovariencyste," *Virchow's Archiv*, Bd. xcvii. S. 131.

structures, or as cellular remnants of the most variable size and form. Newly-formed cells rapidly replace those which have thus performed their office.

Ranging in specific gravity from 1010 to 1050, and of a neutral or alkaline reaction, the contents of the ovarian cystomata vary greatly in consistency; and that not in different tumors merely, but in the various loculi of the same growth as well. Thus we may find a clear, serous liquid present which flows freely through a canula, or a thick, gelatinous substance, the removal of which necessitates the use of the hand; while between these extremes are fluids more or less viscid and ropy, having the consistence of honey or oil, and frothing when well shaken. As a rule, the fluid becomes thinner as a sac increases in size and age, this change being accompanied with alterations in its epithelial lining, the cells of which approach the squamous type more and more. That the ever-increasing intra-cystic pressure accounts for this epithelial flattening in a great measure is doubtless true; but to what extent is the elastic extension of the cell-protoplasm, rendered necessary by the growth of the underlying wall, responsible for the change? Most of the proliferating glandular cystomata, however, are filled with the viscid and gelatinous material, the density of the contents being usually greatest in multilocular (polycystic) tumors of the parvilocular (microcystic) type. In the gelatinous contents of some of the larger sacs, formed by the coalescence of several smaller ones, a close examination will disclose the presence of columnar divisions, corresponding in number to the original loculi, and surrounded in each instance by a thin, whitish layer composed of degenerate epithelia and their disintegrated, fatty remains. These represent the walls of the original cysts, destroyed by mutual compression; and in rare instances one may also find blood-vessels, survivors of the destroyed septa, lying free in the jelly-like or colloid substance. It is possible that these vessels may be the source of spontaneous hemorrhage occurring in the cysts. In the papillary cystomata the fluid is usually thinner and devoid of a glairy or ropy quality.

Hemorrhage or suppuration of the cyst-walls may occur, and occasion marked changes in the appearance of their contents; indeed, the greatest variety of tints, ranging from the lightest gray through the various shades of green, yellow, brown, and red to an intense black, may thus be produced. Of these the dark colors are due to the presence of blood; while pus is more apt to enter largely into the composition of the fluids of lighter color, including the various shades of yellow. Cholesterin imparts a peculiar greenish shimmer to the contents of a cyst, and when very abundant may appear in the form of dense whitish clouds. Spontaneous coagulation never occurs in the fluid of the cystomata, except considerable blood be present; in which case, of

course, fibrinous clots may form. In ascitic fluid, on the other hand, coagula usually appear after the former has stood for from twelve to forty-eight hours. According to Spiegelberg, this constitutes a reliable diagnostic criterion of ascitic fluid; though, inasmuch as spontaneous coagulation of the contents of ovarian cysts has been observed by Martin, Westphalen, Klob, and Scanzoni, it is probable that such is not the case.

A. *Chemical Composition.*—The amount of solid material found in the fluid of the ovarian cystomata varies greatly in different specimens; though such fluctuations are to be ascribed to the organic ingredients (2.5 to 140 parts per 1000) rather than to the salts, the latter remaining nearly constant in amount (7 to 9 parts per 1000). The proportion of these solids seems to exert but a slight influence, however, upon the consistency of the cyst-contents. Proteids or albuminoids, fats, and salts are always present; and among the substances of less frequent occurrence are cholesterin, leucin, ammonia, cystin, allantoin, urea, and indican. The last-named ingredient was found in one case by Garrigues.[1] It is to Eichwald's[2] elaborate researches, however, that we are largely indebted for our present knowledge concerning the various chemical transformations which take place in the fluids of these cysts. According to this writer, these changes are of two kinds, and occur simultaneously, their products forming two series of substances —the *mucin* and *albumen* series. Of these, the former predominate in the contents of more recent cysts, while in larger and older sacs the latter are in excess. The mucin, which is derived from the metamorphosed protoplasm of the epithelium that has undergone colloid degeneration, is gradually transformed into muco-peptone, the products intermediate between the mucin and muco-peptone being termed colloid. Thus colloid degeneration simply means a mucous metamorphosis. The various substances of the mucin series—that is, first, the metamorphosed protoplasm of the lining cells; second, mucin; third, colloid; and fourth, muco-peptone — deport themselves differently in water and various other reagents. The first is soluble only in dilute alkaline solutions, the second dissolves in solutions of the alkaline earths and swells in water, while both may be entirely precipitated with acetic acid. The third, or colloid, is partially soluble in cold, still more in hot, water; and acetic acid produces a cloudiness, but no real coagulum. Finally, the last member of the series, or muco-peptone, dissolves with extreme readiness in water; though in contact with acetic acid no precipitation whatever ensues.

The albumen, which is derived from the blood, occurs in the contents

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[1] *Vide* Garrigues: *Amer. Journ. of Obstet.*, vol. xv. p. 1; also, "Diagnosis of Ovarian Cysts by Means of the Examination of their Contents," Wm. Wood & Co.

[2] "Colloidentartung der Eierstöcke," *Würzburger med. Zeitschr.*, Bd. v. S. 270.

of colloid ovarian cysts in two forms—free albumen and the albuminate of soda; though the changes which result in the albumen series of substances affect the former only, the albuminate remaining unchanged. The former of the two also is coagulated simply by boiling, while the latter requires the previous addition of an acid. The free albumen in the loculi of an ovarian cyst, then, undergoes a gradual transition into albumino-peptone; and while the intermediate products are many in number, but two are recognized; these being fairly representative of the qualities of the rest, though not in themselves of a constant and definite composition. As its metamorphosis progresses the albumen at first ceases to coagulate when heated; that is, it becomes converted into paralbumen. Gradually, a later stage is reached in which the mineral acids fail to cause any precipitation, and to such a product is applied the term metalbumen. The albumen series therefore is composed of, first, albumen; second, paralbumen; third, metalbumen; and, fourth, albumino-peptone. The properties of each of these four substances are identical with those pertaining to the corresponding members of the mucin series, though they are distinguished from the latter by the facts that they contain sulphur and are precipitated by tannin and neutral metallic salts. The effect of boiling upon the fluid contents of cysts varies with the amount of free albumen present. Thus, the fluid may remain quite clear if all the free albumen has already been metamorphosed; though, from the fact that the albuminate of soda is constantly present, the previous addition of an acid always results in a cloudiness due to precipitation.

This gradual conversion of mucin and albumen into soluble peptones, such as are found in the digestive tract, is the result of obscure causes. The process has been attributed to a sort of slow digestion promoted by the sustained heat of the body (Eichwald, Rindfleisch), though no special ferment has as yet been discovered. We have thus learned that the thin fluids found in the larger and presumably older cysts result not only from changes in the lining epithelium of the sacs, but from this transformation of the albuminous and mucous ingredients into soluble compounds. To test ovarian fluid for paralbumen it is permitted to stand for a time in a cool place, and is then passed through a filter or decanted. Through the clear liquid thus obtained a current of carbonic acid gas is passed, which at once precipitates the paralbumen in the form of fine flocculi. The diagnostic value which may be attached to the discovery of paralbumen in fluids removed by exploratory puncture from the abdominal cavity is not yet definitely determined. In the first place, it is not of constant occurrence in ovarian tumors, not even in the proliferating cystomata, though in the latter its absence is comparatively rare. Again, paralbumen has been found in a cervical cyst, in the sputum of bronchitis, in a sacral tumor of fœtal

origin, in the urine, and in ascitic fluid, showing that it is by no means confined to the diseased ovary. It is possible, however, that the cases of ascites were due to ovarian cysts; and in that case the paralbumen might have been derived from the tumors.

Analysis of ovarian fluids affords variable results, but the following example will serve to convey an idea of their composition (Eichwald):

Water	931.96
Organic substances	59.77
Salts soluble in water:	
Potass. sulph. 0.08	
" chlor. 0.59	
Sod. chlor. 6.29	
" phos. 0.16	
" carb. 0.38	
Loss 0.03 7.53	
Salts insoluble in water	0.74
Total number of parts	1000.00

B. *Microscopical Composition.*—When the contents of ovarian cysts are examined with the aid of a microscope having a magnifying power of from 300 to 600 diameters, various morphological structures are observed in a comparatively homogeneous medium of greater or less fluidity. These formed elements vary in number, being generally more numerous in the thicker colloid fluids; indeed, in some of the latter they may be present in such excess as to cut off the light, when a free dilution with water is necessary to bring into view the contours of the individual elements. These may be the following:

1. *Epithelial cells*, from the lining of the cyst, which, when intact, are important aids in forming a diagnosis. Frequently, however, they have undergone more or less fatty change. Besides these single cells the epithelium may appear in flakes of various sizes, produced by the exfoliation in patches of the cellular cyst-lining; while masses of sprouting cells, when present, are suggestive of cancerous changes.

2. *Fat*, in the form of granules of various sizes, ranging from minute, dust-like particles to globules of considerable size. These granules may be free and more or less isolated, or massed together in globular form and supported by a homogeneous substance. In either case they are largely the result of the fatty degeneration and disintegration of cells.

3. *Cells and nuclei* which have undergone colloid degeneration and are represented by large, transparent, colorless globules. These characteristic shining elements, when subjected to the action of the compressor, burst and tear in a radial direction; so that each of the flattened disks is divided into a number of sectors (Wells). Instead of having clear, transparent, homogeneous surfaces, some of these globules may be

more or less completely studded with dark granules ; or the latter may oc-
cur in groups, of which a single colloid globule may contain as many as ten.

4. *Numerous small, round corpuscles,* containing dark molecular
matter or larger strong-refracting granules, and similar in appearance
to the pyoid bodies of Lebert or the exudative cells of Henle.

5. *Blood-corpuscles,* either normal or changed in shape.

6. *Horny epithelium,* in the form of flat scales.

7. *Pigment,* in granules of different sizes, which are either isolated
or in groups, and may be imbedded in the colloid globules. This is
derived from the coloring matter of effused blood.

8. *Cholesterin,* in the characteristic rhombic tablets.

9. *Leucocytes* or *pus-corpuscles,* due to inflammation and suppuration
of the cyst-wall, and frequently in a state of fatty degeneration.

10. *Villi,* in a fragmentary or intact condition, and derived from the
papillomatous outgrowths on the inner surface of the cyst.

Considerable importance has been attached to the " ovarian granular
cell " of Drysdale, which was regarded by its discoverer as pathogno-
monic of ovarian disease when found in the contents of pelvic tumors.[1]
Of almost invariable occurrence in ovarian fluid, this non-nucleated,
round, or slightly oval cell presents a very delicate transparent appear-
ance, and contains a number of fine granules having clear, well-defined
contours. Though by no means of uniform dimensions, the ovarian
cell commonly resembles the pus-corpuscle in point of size ; but its
behavior with acetic acid serves to distinguish it not only from the
latter, but from the lymph-corpuscles, leucocytes, and other similar cells.
Under the action of this acid the cells just mentioned increase in size
and transparency, while from one to four nuclei appear in each. Under
the same circumstances, however, the ovarian cell becomes more trans-
parent and its granules more distinct. With ether the granules of
Drysdale's cell become nearly transparent, though the general appear-
ance of the cell remains unchanged. Unfortunately, however, the
claims of Drysdale respecting these cells have not been verified, since
they merely represent swollen and degenerate epithelia, such as appear
in the fluid of other cysts under similar circumstances ; or, as Garrigues
suggests, they are the nuclei of epithelial cells in a state of fatty degen-
eration. While their presence is thus devoid of any positive diagnostic
significance, the absence of the " ovarian cells " has some negative
value in showing that the cyst is probably not of ovarian origin. What
is thus true of the " granular ovarian cell " may also be said of all the
various other ingredients which enter into the composition of ovarian
fluids : experience has shown that none are sufficiently characteristic to
enable a positive diagnosis to be based either upon their presence or

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[1] T. M. Drysdale : "On the Granular Cell found in Ovarian Fluid," *Trans. of the
Amer. Med. Assoc.*, vol. xxiv. p. 179.

absence. Says one of the latest and best authorities[1] in this con-
nection: "Much has been written on the possibility of diagnosing
ovarian fluid through its chemical composition and microscopical con-
stituents: even the spectroscope has been called in to aid us. Chem-
istry has certainly failed, and so has the spectroscope; and the presence
of certain peculiar cells, which were for some time considered pathog-
nomonic, has now been proved almost valueless for diagnostic purposes.
The vacuolated cells of Thornton and Foulis are now known not to be
characteristic of malignant disease, as was at one time thought certain;
and we are now practically left without any single reliable physical
test of the contents of an ovarian cyst. We can say that a fluid is
ovarian with a greater probability of truth than we can say that it is
not; and in most cases the grounds of this statement might rest as
securely on the simple visual appearance of the fluid as on its compo-
sition or the nature of the cells contained in it. But the value of all
such tests is best estimated by the weight which practical men put upon
it; and that is almost *nil*. We never hear of the removal of ovarian
fluid for examination; the diagnosis is made by other means." Though
not in accord with the opinions entertained by some competent investi-
gators,[2] it is doubtless true that these views of Smith receive the assent
of the great majority of those whom practical experience has qualified
to pass judgment in the matter.

THE PEDICLE OF THE OVARIAN CYSTOMA.—Were we to assume
that the ovary, in its efforts to invade the abdominal cavity, passed
from its original retro-peritoneal site forward and upward between the
two layers of serous membrane forming the broad ligament, and when
nearly through the posterior of these lamellæ had been arrested in its
progress, then the peculiar position of the organ with reference to the
peritoneum would be made clear. The major part of the gland, with
its covering of germ-epithelium, thus projects into the cavity of the peri-
toneum—that is, it is intra-peritoneal (Pl. IV. Fig. 1)—while the base
or hilum is encircled by that portion of the posterior peritoneal layer
of the broad ligament forming the mesovarium; in other words, it is
intra-ligamentous or extra-peritoneal. Should a tumor arise in the
more superficially disposed structures of the parenchymatous zone, it
would naturally tend to invade the abdominal cavity in its growth,
maintaining the intra-peritoneal position of its starting-point, in the
free portion of the ovary (see Pl. IV. Figs. 2 and 3); while, on the
other hand, a tumor arising from the medullary strands of the ova-

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[1] *Vide* J. Greig Smith: *Abdominal Surgery*, London, 1887, p. 86.
[2] Garrigues (*op. cit.*) claims that, even where the patient is unknown, the diagnosti-
cation of an ovarian cyst is almost always possible by studying the physical, chemical,
and microscopical characters of its contents, while in conjunction with the other fea-
tures of a case the probability of success is necessarily enhanced.

rian hilum, and developing in the direction offering the least resistance, would just as naturally preserve a subserous position, displacing successively the loose, intra-ligamentous connective tissue and that filling in the deeper subperitoneal spaces of the pelvis.[1] (See Pl. IV. Figs. 4, 7, and 8.)

Occasionally, however, the disease begins at such a point that the mechanical obstacles to its progress are about evenly divided, and the resulting tumor is partly intra-, partly extra-peritoneal, the distal orifice of the mesovarium encircling the constricted intermediate portion of the growth. In each of the latter two cases of subserous development there would be, of course, no pedicle; though the term "false pedicle" has been applied by Doran to the various pelvic tissues whose excision is necessary in order to effect the removal of such growths. In the case of a small intra-peritoneal tumor arising in the free portion of the ovary, however, its attachment to the uterus or its true pedicle would be the same as that of the ovary itself; though, as the neoplasm developed in size, its growth, coupled with the effects of traction and the changes due to hyperplasia, might result in any of those manifold variations in the pedicle whose occurrence invests each new case with fresh interest in the eyes of the ovariotomist. But before discussing at greater length the formation of the pedicle, a structure of such vast surgical importance, let us revert for a moment to the normal structures concerned in the process.

[1] Freund (*Berl. klin. Wochenschr.*, 1878, No. 28) explains the intra-ligamentous growth of ovarian tumors by assuming that, in consequence of developmental errors, the organ is congenitally displaced, its base being imbedded more deeply than is normal between the folds of the broad ligament. (See also Schmidt: *Dissert. inaug.*, Strassburg, 1879.)

EXPLANATION OF PLATE IV.

The figures of the plate illustrate the typical cysts of the ovary and Wolffian remains, showing their genesis, development, topographical relations, and heterogeneous epithelial covering, as well as the construction of the pedicle. Of these, Figs. 1, 2, 3, 4, 5, 7, and 8 represent antero-posterior sections, cut so as to form an angle of about forty-five degrees with the median plane of the body (vide *s s* and *m m* in Fig. 6). In Fig. 6, however, a horizontal section is shown, while Figs 9 and 10 are front views.

The peritoneum is represented by the blue line, the epithelial covering of the ovary by the interrupted red line (Coblenz): *k*, cyst; *or*, ovary; *p*, peritoneum; *t*, tube; *lr*, round ligament; *bg*, blood-vessels; *u*, uterus; *vg*, vagina; *ota*, abdominal orifice of tube; *av*, broad ligament.

FIG. 1.—Transverse section through the tube, ovary, and round ligament of a newborn child (natural size), showing the peritoneal folds of the broad ligament, interrupted by the ovarian covering of cylindrical epithelium.

FIG. 2.—Multilocular glandular cystoma of the ovarian cortex (region of Pflüger's tubes).

FIG. 3.—Unilocular glandular cyst, having the same origin.

FIG. 4.—Papillomatous cyst of the hilum (zone of Kölliker's medullary strands).

FIG. 5.—Cyst of the parovarium.

FIG. 6.—Same as Fig. 5, though representing a horizontal section through the tube, ovary, and tumor.

FIG. 7.—Intra-ligamentous cyst of Wolffian origin, expanding at the expense of the posterior peritoneal fold.

FIG. 8.—Rarer form of intra-ligamentous cyst, the growth of which causes the protrusion of the anterior layer of the broad ligament.

FIG. 9.—Cyst of the upper or para-uterine portion of Gartner's duct.

FIG. 10.—Cyst of the lower or para-vaginal portion of Gartner's duct.

PLATE IV.

Typical Cysts of the Ovary and Wolffian Remains, showing their genesis, development, topographical relations, and heterogeneous epithelial covering, as well as the construction of the pedicle Coblenz .

Along the upper margin of, and between, the two layers of serous membrane constituting the broad ligament runs the Fallopian tube, which terminates in a fimbriated abdominal orifice, *morsus diaboli,* leaving a portion of the broad ligament, termed the infundibulo-pelvic ligament, intervening between the infundibulum and the lateral wall of the pelvis. Upon the posterior surface of the ligamentum latum, and formed by a special extension of the corresponding serous lamella, occurs a second fold, running in a nearly straight line from the upper angle of the uterus to the morsus diaboli and divided into three portions. Of these, the middle, or mesovarium, sustains the ovary; while the inner and outer thirds include the ovarian and tubo-ovarian ligaments respectively, the latter being reinforced by the ovarian fimbria of the tube. The triangular portion of the broad ligament comprised between the tube and this special ovarian fold is called the *ala vespertilionis,* or bat's wing.

The first of these structures to enter into the formation of the pedicle of an intra-peritoneal ovarian tumor is, necessarily, the mesovarium; though the traction exerted by the growth soon involves the ovarian and tubo-ovarian ligaments, and with the latter, through the agency of the ovarian fimbria, the fimbriated extremity of the tube. As the layers of the infundibulo-pelvic ligament and ala vespertilionis are gradually separated by the force of the growing tumor, the infundibulum, and with it more or less of the ampullar extremity of the oviduct, comes to lie in immediate contact with the growth, though the latter is generally separated from most of the proximal portion of the tube by the greatly elongated and narrowed mesosalpinx. Occasionally, however, even this remnant of the ala vespertilionis is quite effaced; and the thickened, injected, and lengthened tube rests directly upon the surface of the cystoma.[1] Thus in cysts large enough to require removal the pedicle is almost invariably formed of the ovarian ligaments, part of the broad ligament, and the Fallopian tube, though in exceptional cases the last-named structure is not included.[2] All are usually in a condition of more or less marked hyperplasia, though at times atrophy of one or more of the peduncular constituents is observed instead. In rare instances it happens that the atrophic changes in that portion of the broad ligament included in the pedicle are so marked that it divides into two parts, one of which contains the ovarian ligament, the other the tube; or one branch of the double pedicle may be formed of the tube and ovarian ligament, the other of

[1] For a detailed description of the anatomical peculiarities of the various forms of pedicles the reader is referred to Werth's interesting monograph, *Arch. f. Gyn.,* Bd. xv. S. 412.

[2] Though some writers, in enumerating the structures which enter into the formation of the pedicle, include the round ligament, this is hardly proper, since it is never attached to the cyst, and is rarely, if ever, included within a ligature.

the infundibulo-pelvic ligament (Werth, Nussbaum, and Spencer Wells). Should ovarian cysts, however, develop in both ovaries, invade the abdominal cavity, and subsequently undergo fusion, the resulting mass would be attached to the pelvic organs by two true pedicles, each composed of the broad and ovarian ligaments, together with the tube. Doran's experience embraces five such cases. An analogous condition has been observed by Olshausen in two cases, where, though but one ovary was diseased, the tumor possessed two pedicles, each comprising the uterine appendages of the corresponding side. The peduncular attachment to the sound side, however, was of a decidedly anomalous character, the tube and part of the broad ligament having adhered to the surface or become imbedded in a furrow of the tumor. In its dimensions, as well as in the size and number of its vascular constituents, the pedicle exhibits every possible variation. Thus it may form a round, slender stalk four and even six inches long, though more commonly its length ranges from one to two inches. In like manner the breadth of the pedicle varies from a few centimeters to the full length of the broad ligament; and it may form a thick, fleshy mass or a comparatively membranous extension. As a rule, however, pedicles are of moderate length and breadth; when very broad they are usually quite short.

The vessels of the pedicle are derived from the ovarian arteries— the homologues of the spermatic in the male—and from the uterine arteries. The former, which constitute the principal and most direct supply, enter laterally through the infundibulo-pelvic ligament; while the uterine arteries, with their corresponding veins, pass into the pedicle from the uterine side. Occasionally the central portion of the pedicle contains masses of dilated veins derived from the pampiniform plexus and resembling those which characterize varicocele. Long and thin pedicles usually contain fewer vessels than do pedicles which are short and thick, though in the former case they are generally larger than in the latter. While in exceptional cases the veins of a pedicle may rival the little finger in size (T. S. Lee), the diameter of the arteries rarely exceeds that of the radial; and, inasmuch as the blood-pressure is comparatively slight, hemorrhage from the proximal end of a divided pedicle is easily controlled. Lymphatics, nerves, smooth muscle-fibres, and fibrillated connective tissue also enter into the construction of the pedicle.

As we have already seen, small tumors, and especially those of a solid nature, may not possess a true pedicle. The ovary at the point of its attachment to the broad ligament simply widens in a degree corresponding to the size of the tumor, and thus the sessile growth is held in position merely by the mesovarium. Again, the pedicle is absent when the tumor pushes its way between the folds of the broad liga-

ment. In such an event the direction pursued by the cystoma in its development may be most pronounced in either an inward, outward, backward, or forward direction. It may but partially separate the serous layers of the broad ligament, leaving the inferior portion intact; or, passing entirely through, it may invade the pelvic connective tissue and pursue its way in any direction through this yielding subserous material. Thus the base of the tumor may come in contact with the side of the uterus or with the lateral pelvic parietes; it may cause a marked protrusion of the posterior, or more rarely of the anterior, lamella of the broad ligament. (See Pl. IV. Figs. 7 and 8.) Following any of the intra-pelvic planes of connective tissue, the growth may press on to the perineum itself; or, pursuing an upward course, may insinuate itself into the subperitoneal connective tissue, stripping the serous membrane from the anterior or posterior abdominal wall, and in the latter situation perhaps forcing asunder the folds of mesentery, mesocæcum, or mesocolon, thus coming into immediate contact with the intestines themselves.

In the case of the papillary cystomata chiefly, which oftenest develop thus extra-peritoneally, the papillomatous masses, perforating the cyst-wall, may penetrate the bladder, uterus, rectum, or other viscera, the tumor becoming thus incorporated with these structures into one solid mass. The displacement and distortion of the various pelvic and abdominal viscera thus produced by these non-pedunculate, extra-peritoneal cysts can be much more readily imagined than described. Either the whole or only a part of a cystic tumor of the ovary may thus develop beneath the peritoneum; and Olshausen calls attention to the fact that a portion of a tumor previously extra-peritoneal may, by the atrophy and destruction of its serous covering, be laid bare, and thus assume a free intra-abdominal position. Though principally intended to elucidate the growth and topography of cysts developing from the parovarium and other remains of the Wolffian bodies and ducts, Plate IV. may be referred to with profit in connection with the subjects discussed in the present section.

ACCIDENTAL CHANGES IN THE CYSTOMATA.—Among the more important secondary changes of an accidental nature which may affect the ovarian cystomata are—hemorrhage, suppuration and gangrene, torsion of the pedicle, and rupture.

1. HEMORRHAGE.—The effusion of blood into the walls or cavities of ovarian cysts is by no means an uncommon accident, and may result from the operation of any of a number of causes; though at rare intervals a profuse intra-cystic hemorrhage may ensue without any assignable reason. Thus in tapping a cyst a large vessel in its wall may be opened, or this removal of the intra-cystic pressure by puncture or aspiration may be followed by the escape of blood from ruptured

capillaries. Other forms of traumatic influences may bring about the same condition of things, while even the stretching which the cyst-wall undergoes during the growth of the tumor may suffice to rupture a vein. Spontaneous hemorrhage is also prone to take place from the vascular papillomatous structures which spring from the lining membrane of some cysts, the likelihood of such an event increasing with the exuberance of the new papillary growths. Of all the causes resulting in marked spontaneous hemorrhage, however, the most frequent is torsion of the pediele. Though generally slow, slight in amount, and hence more or less latent, the flow of blood is in some instances so profuse as to endanger the life of a patient. In the latter case the dimensions of the cyst may suddenly be increased, when great pain is experienced because of the distension, and symptoms due to the loss of blood supervene. Two cases of this kind have occurred in the practice of Dr. Thomas,[1] while Parry[2] records an instance of dangerous collapse occasioned by sudden intra-cystic bleeding, which was so profuse that within a few hours the diameter of the cyst was increased from one to one and a half inches in every direction. In a fatal case reported by Patruban[3] ruptured vessels were found, this condition having been produced apparently by torsion of the pediele.

2. SUPPURATION AND GANGRENE.—Inflammation attended with suppuration or gangrene rarely attacks the walls of ovarian cysts, save as a result of peduncular torsion; and in any event the *raison d'être* of these exceptional cases may almost invariably be traced to surgical interference, vegetable organisms of a septic character having gained entrance during the operation of tapping, for example, either through the use of unclean instruments or from failure in some other respect to exercise the strictest antiseptic precautions. Occasionally, however, suppurative or gangrenous inflammation of a cryptogenetic character affects simple cysts as well as proliferating cystomata: the cause is obscure, and, to all appearances at least, the disease is quite spontaneous. But in all probability these cases too are of fungous origin; and, when we consider the prevalence in them of adhesions between intestine and cyst-wall, the explanation of Olshausen, to the effect that the suppuration is the result of a direct bacterial migration from the former, seems very plausible. This view is apparently disproved by the unique experience of Weil,[4] who met with a case of intra-cystic suppuration in which tapping had not been resorted to and where no intestinal adhesions existed. In attempting an explanation, this

[1] *Diseases of Women*, 5th ed., p. 695.
[2] *Amer. Journ. of Obstet.*, Nov., 1871. A similar case is reported by Rosenberger, *Berl. klin. Woch.*, 1880, S. 270.
[3] Quoted by L. Gallez: *Histoire des Kystes de l'Ovaire*, Bruxelles, 1873, p. 150.
[4] *Prag. med. Wochenschr.*, 1878, No. 43.

observer assumed that septic organisms found their way into the cyst from the blood; but it must be borne in mind that any previous adhesions which may have been present might easily have been loosened during the operation without exciting notice. The great pressure to which pelvic tumors are subjected during parturition may also give rise to suppurative inflammation.

3. TORSION OF THE PEDICLE.—If, from any cause, a rotary motion is imparted to an ovarian tumor, its pedicle becomes twisted, and symptoms of a subjective and objective nature supervene, the importance of which is proportional to the amount of compression which the torsion exerts upon the vessels of the part. Naturally, one would expect this accident to occur oftenest in the case of firm, small tumors, or those of medium size, whose peduncular attachments were long and slender; and, as a matter of fact, this is true, though it is possible for axial rotation to take place in any of the pelvic tumors, provided they be free to move and have pedicles which admit of twisting. It would certainly be difficult, however, even to imagine the rotation of a proliferating cystoma so large as to fill completely the pelvic and abdominal cavities—such a growth as stamps its victim with that peculiar physiognomy, the *facies ovariana*, so graphically described by Wells. And, even after being reduced in size by puncture, the flaccid, yielding wall of such a large cyst, by conforming to its uneven environment and merely giving way locally before any force brought to bear upon it, would prevent the rotation of the tumor by those various agencies to which this accident has been attributed. In like manner, a tumor having a very short or a broad and thick pedicle would be proportionally less liable to turn upon its axis. The special frequency with which dermoid cysts are affected in this manner, and the comparative rarity of the accident in the case of solid ovarian tumors, serve to corroborate these statements. In the former instance we have firm tumors of moderate size, and provided generally with small pedicles; while, on the other hand, the peduncular attachments of solid ovarian growths, being usually short and thick, are well calculated to resist the action of those forces which result in torsion. The attention of the profession appears to have been first directed to this incident in the life-history of ovarian tumors, which is so important from both a pathological and clinical point of view, by Rokitansky. According to this author, torsion of the pedicle occurs in about 12 per cent. of all cases of ovarian tumors, and in about 6 per cent. is the cause of death, though widely different results are given by other observers.[1] Thus, Tait met with but 1 case in his first 100 ovariotomies; while Wells observed the condition at

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[1] *Vide* Rokitansky: "Ueber der Strangulation von Ovarialtumoren durch Achsendrehung," *Zeitsch. d. K. K. Gesellsch. d. Aerzte in Wien,* 1865; also, the *Lehrb. d. path. Anat.,* by the same author.

least 12 times in 500 operations of this character; Thornton, 34 times in 400; Schroeder, 27 times in 194; M. Terrillon,[1] 4 times (complete) in 100; and Olshausen, 21 times in 322 ovariotomies. Of these writers, the last named estimates that torsion probably occurs in about 8 per cent. of all cases. The degree of torsion ranges usually from one half to two revolutions, though as many as five and six complete turns of the tumor have been reported by different observers. Since the ovarian ligaments and more or less of the broad ligament are always included in the pedicle, these structures are invariably affected; while the tube, which is usually though not necessarily involved, describes in the former case a spiral around the outside of the pedicle, or, if adherent to the tumor, around both tumor and pedicle. When not included in the pedicle, the tube of course remains unaffected by the axial rotation of the tumor; and, as for the round ligament, this is very rarely involved.

In rotating, a tumor of either ovary may turn to the right or left; that is, a point on its upper or anterior surface may move in these directions,[2] or, in other words, the growth may twist in the direction taken by an advancing or receding screw respectively. Moreover, the tumor may turn upon a lateral axis, either backward or forward. As a rule, rotation takes place gradually, though at times it is apparently rapid in its occurrence. Again, the twist may not be permanent; but the neoplasm may subsequently turn back to its original position, or even beyond it. Should this recur, the motion would have an oscillating character, its various phases being evidenced perhaps by both subjective and objective signs.

The *causes* to which this accident is to be ascribed are not clearly known, though many theories have been advanced. Thus, some attribute the torsion to the peristaltic movements of the intestines; Klob, to the alternate filling and emptying of the bladder; while Thornton,[3] who believes the former cause to be especially potent in the case of cysts rendered flaccid by tapping, asserts that the pulsations in the twisted pedicle would tend to increase the condition when once thus started. Others (Fritsch, Olshausen) deem irregular growth of the tumor a potent factor. One sac outstrips the others in its development, or heavier solid tissue predominates in a secondary cyst, whereby the centre of gravity is displaced and partial rotation of the growth ensues, which may later be rendered complete by changes in the posi-

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[1] Quoted in the *Medical Press of Western New York*, Dec.. 1887.

[2] In speaking of the rotation of an ovarian tumor, the direction first taken with reference to the body of the patient by that portion of its wall which corresponds to the upper surface of the ovary itself is considered.

[3] Consult Thornton's article on the "Rotation of Ovarian Tumors," *Med. Times and Gaz.*, vol. ii. p. 82.

tion of the patient. It is possible, too, that a rotary motion may be imparted to a growing tumor in its passage from the pelvis to the abdominal cavity, because of the peculiar conformation of the former. The development of a second tumor, as the uterus in pregnancy, may cause the rotation of an adjacent ovarian growth; while the same effect is at times produced by the evacuation of the uterus in parturition or by tapping. The presence of ascitic fluid would, of course, favor the occurrence of this accident, just as the presence of adhesions would tend to prevent it. According to Tait's theory, which is based upon a rather limited personal experience, the passage of fecal matter through the rectum is the prime factor to which twisting of the pedicle must be attributed.[1] In all of this observer's cases the tumor had developed from the right ovary, and, with one possible exception, the direction of the twist was from left to right. Tait therefore assumes that the growth from the right ovary is provided with a free pedicle and lies obliquely in the abdominal cavity, the upper extremity of its long axis being directed toward the "top of the ninth or tenth rib on the left side." Now the conditions would be most favorable, and, especially when the patient was lying down, all hard fecal matter, in passing behind or beneath the tumor, would act as a wedge and effect its gradual rotation. With this view Doran[2] concurs, though disposed to grant priority to the simpler doctrine, that the tumor, held at both ends but comparatively free in front and at the sides, revolves on its axis in the various positions assumed by its host. Unfortunately for Tait's premises, however, Olshausen states that in 15 out of his last 19 cases of torsion the tumor had developed from the *left* ovary. Where each ovary is replaced by a tumor, double torsion may occur, Thornton, Röhrig, and others having reported such cases.

The *consequences* entailed upon both tumor and patient by torsion of the pedicle are manifold, varying with the rapidity of its occurrence as well as with its degree. Should the circulation through the pedicle be suddenly and completely arrested, the tumor is entirely deprived of nourishment, and, as a necessary result, perishes almost instantly. Decomposition rapidly supervenes in the mass of dead tissue, an acute diffuse peritonitis is lighted up, and, unless operative interference be promptly resorted to, death quickly puts an end to the patient's misery. Thousands have thus perished in times past from the gangrene of ovarian tumors resulting from torsion of the pedicle; but it is refreshing to know that since the condition has been recognized, and the necessity of immediate operation appreciated, the number of victims has been somewhat reduced.[3] Fortunately, however, such extreme

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[1] *Diseases of the Ovaries,* Amer. ed., p. 302 *et seq.*   [2] *Op. cit.,* p. 119.

[3] Accounts of such operations, some successful and others not so, are given by Wells, Thornton, Tait, Wiltshire, and many others.

cases occur only exceptionally : as a rule, the interference with the circulation in the pedicle is more gradual and less marked. Thus, while the lymphatics and thin-walled veins quickly yield to the compression exerted by the torsion, the thick walls and greater tension of the arteries enable them to offer a more effectual resistance; and, consequently, the arteries continue to force into the tumor more blood than the veins are capable of removing. The mechanical or venous hyperæmia thus produced results in the transudation of serum, the diapedesis of red blood-corpuscles, and perhaps in hemorrhage. In the latter case the engorged veins and capillaries give way under the heavy strain, and blood is effused into the cysts, the walls of the tumor, or its pedicle. The severity of the hemorrhage varies, being at times so slight as to cause few symptoms; while, again, the amount of blood lost is so great as to occasion marked anæmia, or even death itself. Numerous instances of severe intra-cystic hemorrhage have been reported by various observers, while Wells and Patruban[1] mention cases having a fatal termination. The œdema, hyperæmia, and effusion of blood, resulting from this partial strangulation of the pedicle, produce a rapid and characteristic enlargement of the tumor that may either precede or accompany the sudden and severe abdominal pain and tenderness, which, with vomiting, are especially symptomatic of torsion. In these cases the main cyst-wall presents a changed appearance. Instead of the glistening, wellnigh silvery, surface which marks the ordinary growth, more or less discoloration is observed, the tumor assuming any shade ranging from gray nearly to black. It is not merely to the intra-cystic blood, however, or to that extravasated within the walls of the tumor, that this is to be attributed, but rather to the process of imbibition, whereby the coloring matter of the underlying blood is absorbed.

But even though the strangulation of the tumor be not expedited by the continuation of its axial rotation, the changes which ensue in the pedicle tend to produce this result, though more slowly. Œdema and extravasation, coupled with the twisting which it has undergone, cause the enlargement of the pedicle; its veins become filled with clotted blood or thrombi; its arteries are obstructed by the increased pressure to which they are subjected; the pedicle itself suffers from want of nourishment, undergoes fatty degeneration, grows soft and friable, and finally gives way entirely, perhaps leaving the tumor devoid of any peduncular attachment to the uterus. Gangrene, however, rarely supervenes in these cases; for, while the food-supply through the pedicle is being gradually cut off, the tumor forms other alliances through which its needs are vicariously supplied. The nutritive disturbances excited in the growth by this interference with the circulation through its ped-

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[1] *Oester. Zeitschr. f. pract. Heilkunde,* 1855. *Vide* article by Hunter, *Medical Record,* April 18, 1885.

icle result in a conservative peritonitis; adhesions of greater or less extent form between the tumor and the surrounding serous surfaces; the new vessels contained in these bands of recent connective tissue enlarge, to meet the increasing demands made upon them because of the gradual stoppage of the peduncular supply; and, finally, though entirely deprived of its original support, the growth of the tumor goes on, perhaps more rapidly than before, though occasionally retrogressive changes ensue. The adhesions, by which the "transplanted" tumor is enabled to maintain its parasitic existence, connect it with the abdominal wall, omentum, intestines, mesentery, or other organs. Interesting cases of this kind have been reported by Wells, Tait, Doran, Baumgarten, Hofmeier,[1] Peaslee,[2] and others. By reason of the movements of the tumor or of the organs to which it may be attached, the adhesions may be drawn out into vascular shreds or cords, which impart the shaggy appearance shown in the accompanying illustration (Fig. 339). The most desirable result which can follow rotation, however, is the involution and atrophy of a tumor, to which attention was first directed by Rokitansky. This takes place in cases where the supply of blood is diminished by the torsion to such an extent that it no longer suffices for the complete sustenance of the tumor, though still large enough to prevent the occurrence of gangrene.[3] The secondary changes in such cystomata are chiefly fatty degeneration and calcification, the tumors diminishing in size with varying rapidity, and their remains finally appearing as hard masses, within which more or less fatty detritus of a brownish color is usually found. Should adhesions subsequently form, such retracted tumors may again increase in size. Olshausen, Flaischlen, Hofmeier, Veit, and Breisky mention cases in which this marked diminution

FIG. 339.

A Cyst which had been Separated from its Pedicle by Torsion, and received its nourishment through adhesions (Doran).

in the size of the tumor occurred. In one instance the patient experienced excruciating pain for some hours; when, after first increasing in size, the tumor, which reached to a point midway between the umbilicus

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[1] *Zeitschr. f. Geb. und Gyn.*, Bd. v. S. 1.   [2] *Amer. Journ. of Obstet.*, 1878.

[3] Atrophic changes in an ovarian tumor have also been caused by inflammatory adhesions; the pedicle, which was free from twists, being sufficiently compressed by the contraction of the new tissue.

and ensiform cartilage, gradually grew smaller, till, after the lapse of some seven years, its dimensions did not exceed those of a hen's egg.[1] The observance of these isolated cases of spontaneous recovery naturally led to the idea that this most desirable consummation might be effected by proper manipulation, and the artificial production of torsion has been gravely suggested as a therapeutic measure. When one considers, however, the difficulties involved in the estimation and production of the proper degree of rotation, and the risks incurred from failure, it becomes evident that so desperate an expedient will seldom be resorted to. The symptoms following the accidental twisting of the pedicle have certainly not been reassuring in this respect. Thus, while examining a patient under an anæsthetic, Olshausen produced torsion of an ovarian tumor, the accident being followed by an acute circumscribed peritonitis which quickly resulted in fixation. Schroeder also mentions a case in which he was enabled to turn the tumor for a certain distance in either direction, though the supervention of violent pains soon necessitated its restoration to a normal position.

Another grave, though fortunately rare, consequence of torsion is obstruction of the intestines; the bowel sharing in the rotary motion of the tumor because of adhesions between the two, or becoming entangled in the turns of a long pedicle. In a case described by Guenther the result was the same, though effected in a peculiar manner. The twisting of the pedicle naturally caused a shortening, in consequence of which the tumor was drawn into the inlet of the true pelvis, thus forcing the rectum against the pelvic brim and causing its complete occlusion.

4. RUPTURE OF OVARIAN CYSTS.—That this accident, the potential importance of which is so great, complicates the life-history of ovarian tumors far more frequently than one would suspect on first thought, is abundantly demonstrated by the experience of many leading operators. Thus, Wells declares that in 300 of his more recent ovariotomies this condition presented itself 24 times; while Thornton met with free fluid in the abdominal cavity, as the result of rupture, 40 times in performing 400 operations of the same nature. Still more frequently, perhaps, than actual perforations are found the cicatricial areas which mark the sites of former ruptures.

The *causes* which lead to rupture are various, and comprise those of a predisposing, as well as of an immediate or exciting, character. In the first place, the thinning of the cyst-wall from pure distension occupies a prominent place in the former list. If the main wall of the proliferating cystomata especially be examined, it will be found to vary markedly in thickness; some portions being firm and strong, while others are so thin as to be nearly or quite transparent. Further

[1] *Vide* Breisky: *Wien. med. Presse*, Bd. xxiii. S. 601.

observation will disclose the fact that these transparent areas correspond in position with secondary cysts which press against the main wall; and it becomes apparent how a degree of tenuity is sooner or later reached which is poorly adapted to resist even the bursting force exerted by the cyst-contents, to say nothing of external violence. Where distension occurs more slowly, however, the cyst-wall undergoes retrograde changes due to chronic localized anæmia. It becomes fatty and atrophied; or, again, irregular patches of a dull yellow or brown color, such as are described by Wells, appear on the inner surface of the cyst-wall, representing degenerated tissue, the result, in all probability, of inflammatory changes. Should one of these atrophied or degenerate patches rupture, the edges of the opening may assume a reddish, thickened appearance, conveying the impression that the accident was due primarily to ulceration of the cyst-wall. As a rule, however, the reverse is the case. When the rent first takes place in such tissue, its margins are naturally thin, and it is merely to a secondary inflammation, evoked by the irritating discharge, that the appearances to which we have just adverted are to be ascribed. When small secondary cysts develop in the main wall of the tumor and rupture internally, discharging their contents into the cavity of the principal cyst, their remains are represented by circular or oval patches, covered with the original cubical or cylindrical epithelial lining of the small cysts, and surrounded by their collapsed walls. (See Fig. 328.) Such circular or oval depressions with their raised borders are also frequently referred to as "ulcerations." These patches become converted later into a sort of cicatricial tissue, which is apt to degenerate and give way; in fact, this process, whereby the effacement of secondary cysts is accomplished, constitutes one of the most frequent among the predisposing causes of rupture. The formation of thrombi in the vessels of the cyst-wall, resulting perhaps in fatty degeneration, softening, and gangrene; the various nutritive changes consequent to torsion of the pedicle which we have just considered, as well as the hemorrhages, both intra-cystic and interstitial, from the same cause; severe suppurative inflammation of the main wall; the growth of papillomata,— all these certainly favor the occurrence of rupture, though not necessarily resulting in this accident.

The immediate causes may be grouped under the one head of *pressure*, applied suddenly or more slowly, and varying markedly in degree. Thus, the jar attending a slight misstep, or even a change of position, such as turning in bed, may be sufficient to cause a weakened cyst to give way. Coughing has resulted in rupture (Doran), as well as falling on the ice (Simpson) or down stairs (Schroeder). Direct blows upon the abdomen, the manipulations attending physical exploration, the muscular force exerted in parturition, the pressure of forceps, forci-

ble contact with the brim of the pelvis, or any other condition result-
ing in the application of pressure to such a tumor, may precipitate its
rupture. The presence of papillomatous growths within a cyst greatly
increases its liability to rupture, as we have already seen in a previous
section. The luxuriant development of the papillary masses results in
pressure upon the walls of the sac after its interior is completely occu-
pied, and perforation is the final outcome of the gradual erosion thus
excited. Less frequently the proliferating cauliflower-like structures
seem to invade the wall of the cyst directly; though in either case,
after escaping from the confines of the sac, the papillomatous excres-
cences manifest their well-known tendency to spread over the outer
surface of the tumor and that of the adjacent organs, even penetrating
these in their growth. In form, the rupture may appear as a rent or
tear or as a round or irregular opening, the dimensions varying greatly
in either instance; while an aperture, originally small, may be widened
by the wedge-like entrance of papillomatous growths or small second-
ary cysts.

The *results* of rupture vary with the amount and quality of the
cyst-contents, the rapidity and direction of the discharge, as well as
with the degree of bleeding which may be excited by the lesion itself.
According to Nepveau and Aronson, the mortality in consequence of
this accident amounts to about 40 per cent.; though this figure is evi-
dently based upon incomplete data, and refers merely to cases whose
symptoms were sufficiently characteristic to serve as diagnostics. When
we consider that in the majority of cases the indications of rupture are
so slight as to be quite overlooked, it becomes evident that the above
estimate is too great, and that the real percentage of deaths is compara-
tively small. When an ovarian cyst ruptures, its contents escape into
the abdominal cavity in by far the larger number of cases; and the
effects produced by such a foreign invasion vary in accordance with the
conditions already enumerated. Should a bland, unirritating fluid
thus gain access to the peritoneal cavity, little or no reaction might
ensue, even though the effusion was considerable in amount. Nature
would rid herself of the intruding fluid by the process of absorption;
and, if it were abundant, the success of her efforts would be attested by
an increased flow of urine, and perhaps of perspiration. In illustra-
tion of this might be cited a case reported by Lambert,[1] in which rup-
ture was followed by anasarca and profuse diuresis, sixty-five pints of
urine being discharged in the course of four days. The escape of col-
loid material is likewise attended with little disturbance when free
from pus, blood, septic organisms, or other substances of an irritating
nature; although its absorption is effected more slowly than in the case
of fluids. The presence of these noxious elements, however, is always

[1] *The Lancet,* May 29, 1879.

productive of mischief more or less marked; the cyst-contents are no longer of an indifferent character, but irritating; an inflammation is excited which may prove fatal; or, finally, a lethal result may follow from the immediate shock of the accident or from septicæmia, rather than by reason of the peritonitis. These are the cases in which the amount of the exudation becomes a matter of such serious import; for, while it is true that the contents of a very small sac may suffice to light up a fatal peritonitis, the effects of such an irritant are usually somewhat proportional to its quantity.

The *rapidity* with which the contents of a ruptured cyst escape is also a matter of importance, a gradual effusion being most favorable as well as most common. Where the cyst-wall is perforated by papillomatous growths the leakage is generally slow; inasmuch as the papillary masses, by crowding into the aperture, tend to fill up the very rent which they produce. The same result may be accomplished by a secondary cyst, which presses against, or even invades, the opening in the ruptured sac. Symptoms of shock usually supervene early when the abdominal cavity is flooded through a large opening in a cyst of considerable size. As a rule, the hemorrhage attending the rupture of a cyst is slight, owing to the diminished vascularity of that portion of the wall which yields. Should the cyst-wall be well supplied with blood-vessels, however, or should its interior contain vascular growths, the tear, coupled with the removal of that support afforded by the contents, previous to their escape, might result in a very serious, or even fatal, loss of blood. We have already alluded to the fact that the rupture of an ovarian cyst containing papillomatous masses is very apt to be followed by the general infection of the peritoneum, secondary growths springing up in all directions, and often deporting themselves in a manner altogether suggestive of great malignancy. In like manner, though much more rarely, the escape of the colloid contents of a ruptured glandular cystoma may be followed by the appearance of tough and somewhat vascular gelatinous masses, of a gray or yellow color, on the surface of the peritoneum. These secondary growths assume the form of jelly-like nodules, ranging from a minute size to that of a hickory-nut; or they may become confluent, covering the abdominal viscera with a continuous layer of the same material. Because of their appearance, and the fact that they often contain mucin, such formations are usually spoken of as *myxoma peritonei*— a term which Werth, who regards them as distinct from the myxomata, replaces with *pseudo-myxoma peritonei*. Should a cyst have undergone carcinomatous or sarcomatous change, its rupture would probably be followed by the appearance of metastatic growths of like character in the abdominal, thoracic, or cranial cavities.

It is in these very cases, however, that Nature's conservatism is most

beautifully displayed. She strives—though often in a blundering and futile manner, 'tis true—to avert the evil consequences of rupture into the peritoneal cavity ; and, fortunately, her efforts are furthered by the fact that those conditions which result in the escape of inflammatory, septic, or malignant elements from the cyst are almost invariably caused by, or attended with, inflammation of its walls.

It is in consequence of this inflammation, or of direct irritation, that a plastic peritonitis, Nature's chief prophylactic agent, is excited, which results in the formation of more or less extensive adhesions between the tumor and the adjacent serous surfaces. Should perforation of the diseased cyst-wall now ensue, its contents would not escape directly into the peritoneal cavity, but, meeting with the layer of new connective tissue comprising the adhesions, they might pass both through it and the adjacent structures. In this manner the cyst may rupture into the intestines, stomach, vagina, Fallopian tube, or bladder, as well as externally through the abdominal walls ; and it is almost needless to say that in any of these events the patient's chances of spontaneous recovery are greatly enhanced. That the cure of multi-locular cystomata does not result from rupture can be easily understood. It is only in the case of monocystic growths that such a mode of recovery becomes possible, and even then it forms the exception rather than the rule.

CYSTS OF THE BROAD LIGAMENT.

PAROVARIAN CYST.—Between the folds of the peritoneal reduplication which constitutes the broad ligament are found, as we have already seen, the tube, part of the ovary, the ovarian and round ligaments, blood-vessels, nerves, lymphatics, and smooth muscular fibres— all supported by that loose areolar connective tissue which prevails throughout the pelvis as its stroma, so to speak, and which plays such an important rôle in some of the inflammations of the latter region. But besides these, and of far greater interest to us in this connection, are the remains of the embryonic mesonephros (Lankester) or Wolffian body, and of its excretory (Wolffian or Gartner's) duct, which are likewise found after birth in the broad ligament. Of these persistent tubular remnants of the Wolffian bodies—the atrophied representatives of such portions of the mesonephros as did not enter into the formation of the internal genital and urinary organs of the female— two groups are distinguished, corresponding to the two divisions of these embryonic glandular organs of Wolff, recognized by Müller, Banks, Bornhaupt, Waldeyer, and others. These observers distinguished (1) the *sexual* (Bornhaupt) from (2) the *primitive renal* portion of the Wolffian bodies, the atrophied vestiges of which are respectively

represented by (1) the " parovarium " of Kobelt—also called the epoöphoron (Waldeyer) and the organ of Rosenmüller—which corresponds to the epididymis of the male ; and by (2) the " paroöphoron " of His and Waldeyer, the homologue of the organ (*le corps innominé*) of Giraldès or paradidymis of Waldeyer.

The *parovarium* can be exposed to view by carefully removing the posterior layer of that part of the broad ligament lying between the ovary and tube, called the ala vespertilionis ; and for such dissection the normal organs of a young adult virgin answer best, we are told by Doran.[1] Or, should a multilocular glandular cyst of the ovary be removed before it has undergone inflammation or contracted adhesions with the surrounding structures, the parovarium will show clearly when that portion of the cyst-wall upon which the elongated tube and stretched broad ligament rest is viewed by transmitted light. This organ will then be found to consist of a cluster of delicate converging strands, representing the upper or anterior tubules of the Wolffian body—that is, of its " sexual " portion ; the whole group presenting somewhat the form of an inverted triangle, the base of which is directed toward the Fallopian tube, while its truncated apex terminates in the ovarian hilum. Though but ten to fifteen tubes are usually seen, as many as twenty-four have been observed by Doran in a case where the corresponding ovary had undergone cystic degeneration ; in fact, ovarian disease always renders the parovarian structures more distinct. From the hilum of the ovary, in which these vertical tubes of the parovarium are lost, they radiate upward, and finally terminate in a horizontal tube or efferent duct, which constitutes the duct of Gartner, and is both more persistent and better developed in some of the lower mammalia than in woman.

From its outer blind extremity, which frequently undergoes cystic enlargement, and is then usually pedunculated, though not necessarily so, the duct of Gartner has been traced by Coblenz[2] and others, in woman and in domestic animals, across the broad ligament to the uterus, and through the walls of this organ and the vagina to the urethra, where it terminates.[3] The diameter of the vertical tubes of the parovarium ranges from 0.3 to 0.5 mm. ; while their walls, 0.05 mm. in thickness, consist of fibrous tissue disposed in two layers—an outer one of circular fibres, and an inner one, the component fibres of which have a longitudinal arrangement. In the most perfectly preserved of these

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[1] It has been the writer's privilege to examine the beautiful specimens illustrating the normal and morbid anatomy of the broad ligament which were prepared by this investigator for the museum of the Royal College of Surgeons, London.

[2] Comp. *Virchow's Archiv*, Bd. lxxxiv. S. 26.

[3] Whether the fine tubules opening at the external orifice of the urethra really represent the lower ends of Gartner's ducts, or simply the outlets of the urethral glands described by Skene (*Amer. Journ. of Obstet.*, vol. xiii. p. 265), is still a mooted point.

tubules the lining is composed of ciliated columnar epithelium, in a single layer; though usually their lumina contain merely a granular detritus, representing the remains of the broken-down epithelium, with occasional patches of low columnar epithelial lining. According to Coblenz, the duct of Gartner, when perforate, is lined with cylindrical epithelium, though Doran's observations indicate that the cells are very flat, approaching the endothelial type.

The *paroöphoron* of Waldeyer—which, as we have seen above, corresponds to the organ of Giraldès or paradidymis in the male, and which represents the atrophied tubular remains of the lower, posterior, or primary renal portion of the Wolffian body—may likewise be disclosed by carefully dissecting the broad ligament of an adult woman, and will be found lying between the parovarium and uterus, often extending to the very border of the latter. The organ consists of a group of narrow, anastomosing tubules, filled with epithelial cells and their débris,[1] and is by no means as well marked as the parovarium.

The expression "parovarian cyst" has been most freely used in the past, any cystic tumor of the broad ligament which was evidently not of ovarian or tubal origin, and which answered to certain general requirements of an anatomical and clinical nature, having been placed in this category, regardless of genetical distinctions. Now, however, inasmuch as we know that not merely the parovarium, but the paroöphoron, and, in fact, any point of the broad ligament, may be the scene of these dropsical distensions, it is far better to speak of them generally as "cysts of the broad ligament," reserving the term "parovarian" for those special cases in which it may properly be employed.

Of almost constant occurrence is a pedunculated pyriform cyst, attached to the Fallopian tube by what appears to be one of the fimbriæ; though, in reality, it represents the dilated blind extremity of Müller's duct, the pedicle being the imperforate portion of the duct lying beyond the infundibulum, or abdominal orifice of the tube. This cyst, which is homologous to the "hydatid of Morgagni," never undergoes any special pathological enlargement, and is lined, according to Doran, with a single layer of flat epithelial cells instead of the ciliate epithelium of the tube (Fig. 340). While this hydatid of Morgagni is often confounded with a sessile cyst of the broad ligament which develops on the mesial side of the fimbria ovarica, the two are quite distinct and may occur simultaneously, as shown in the following cut. Attention has already been directed to the fact that the blind extremity of Gartner's duct also is frequently converted into a cyst. When pedunculated, as it usually is, such a cyst never reaches any great size, since its pedicle easily becomes twisted and is poorly provided with blood-vessels; occasionally, however, it continues its intra-ligamentous growth,

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[1] Waldeyer: *Eierstock und Ei*, S. 142.

forcing asunder the peritoneal folds of the broad ligament, and finally
forming a typical parovarian cyst. It would be quite impossible, how-
ever, in the last two instances to distinguish the parovarian from the
non-parovarian cyst, except in the early stages of their growth; since

FIG. 340.
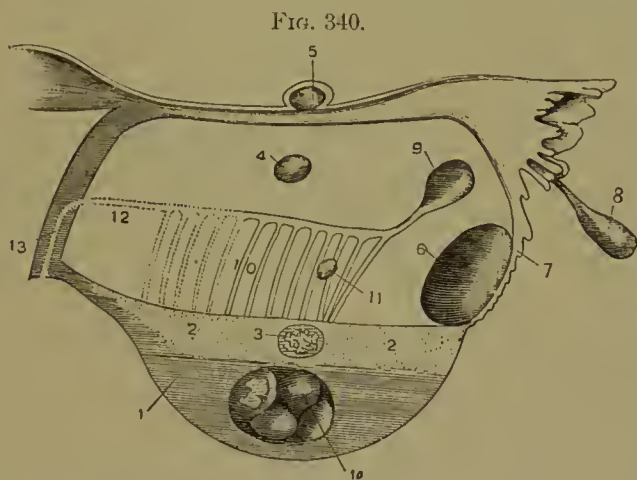
Diagram of the Structures in and adjacent to the Broad Ligament (Doran): 1, free portion of
the ovary, the seat of a simple or glandular cystoma, 1a; 2, ovarian hilum, with 3, a papil-
lomatous cyst; 4, cyst of the broad ligament, independent of Wolffian structures and tube;
5, a similar broad-ligament cyst, lying above the tube, but having no connection with it; 6,
a cyst developed close to 7, the ovarian fimbria; 8, hydatid of Morgagni; 9, cystic enlarge-
ment of the horizontal tube of the parovarium; 10, parovarium, the dotted lines represent-
ing the inner portion, which is always more or less obsolete in the adult; 11, a small cyst of
a vertical parovarian tubule; 12, duct of Gartner, often persistent in the adult as a fibrous
cord; 13, continuation of the duct in the uterine wall, from which Coblenz asserts that para-
uterine glandular cystomata may develop. Cysts 4, 5, 6, 8, and 9 are always lined internally
with a simple layer of endothelium; while cysts of the vertical parovarian tubules have a
lining of cubical or ciliated epithelium, and, as in the case of hilum-cysts, 3, are prone to
develop papillomatous growths.

in the character of their lining, as in all other respects, they are seem-
ingly identical—a fact which supports the above nomenclatural sug-
gestions. It is not merely in the immediate neighborhood of the ova-
rian fimbria, however, that cysts having no connection with ovary,
parovarium, or tube develop. They may make their appearance in
any portion of the broad ligament, either above or below the tube;
they may be sessile or pedunculate, minute or of considerable size,
single or more or less numerous; and, as in the above instance, they
may sometimes come to resemble those developing from the efferent
duct of the parovarium. In attempting to explain the genesis of these
non-parovarian and widely-distributed cysts of the broad ligament,
Waldeyer assumes that, during the embryonic period, patches of ger-
minal epithelium, scattered over the surface of the broad ligament,
become surrounded by the connective tissue of the part in its growth;
and that, in all probability, such capsulated remains may later undergo
cystic change. According to this theory, such cystic tumors of the

broad ligament would correspond to dropsical ovarian follicles. Doran refers to a "cystoid" degeneration of the broad ligament which has come under his observation, where small, cyst-like bodies appear as the result of localized serous transudation. In such cases the interference with the circulation, to which this effect is due, is frequently caused by the traction of uterine tumors, the cysts disappearing when the parts are restored to their natural position by the removal of such growths. Small cysts arising from the vertical tubes of the parovarium (see Fig. 340), or from those of the paroöphoron, are quite common; though it is by no means unusual to find them of such a size as to call for removal, some even rivalling the ovarian cystomata in their dimensions. Of two hundred and eighty-four tumors of the ovary and parovarium operated upon by Olshausen, over 11 per cent. originated in the latter organ. These cysts are generally lined with ciliated epithelium; though this is often replaced, in whole or part, by non-ciliate columnar or cubical cells, the cilia tending to disappear with the growth of the tumor, and probably in consequence of the increasing pressure of its fluid contents.[1]

But it is not merely in the character of their lining that the cysts in connection with the vertical canals of the parovarium differ from simple cysts of the broad ligament : they are also distinguished by the fact that papillary growths are apt to develop on their inner surfaces. This latter tendency, however, is nowise remarkable ; it is merely what one would predict after reflecting upon the fact that the lower ends of these same vertical tubes enter the ovarian hilum, and there give rise to the papillary cystomata which are so characteristic of that region. (See Pl. IV. Figs. 4–6.) Though by no means common, such papillary cysts of the parovarium are seen with sufficient frequency to be quite familiar to the pathologist, the ovary remaining free from disease. Clinically, they exhibit the same destructive and malignant qualities as their ovarian congeners ; the papillary formations manifesting a disposition to perforate the wall of the cyst and proliferate luxuriantly over the adjacent organs, invading, with the aid of intestinal peristalsis perhaps, any portion of the peritoneum, whether visceral or parietal. This unfortunate possibility militates against the more general adoption of the simplest treatment in the case of broad-ligament cysts—that by tapping—since parovariotomy is probably preferable to the risk of peritoneal infection incurred in the former operation. As for multilocular cystomata of the glandular type, they have never yet been observed in the broad ligament, save in those exceptional cases of ovarian origin which develop in that direction instead of toward the

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[1] For more detailed descriptions of these growths the reader is referred to Spiegelberg, *Arch. f. Gyn.*, Bd. i. S. 482; also Fischel, "Ueber Parovarialcysten und parovarielle Kystome," *Arch. f. Gyn.*, Bd. xv. Heft 2.

abdominal cavity. Glandular depressions lined with columnar epithelium have, however, been observed by Fischel in the wall of a parovarian cyst.

These tumors of the broad ligament are almost invariably unilocular, though polycysts do occur. Theoretically, there certainly seems to be

FIG. 341.
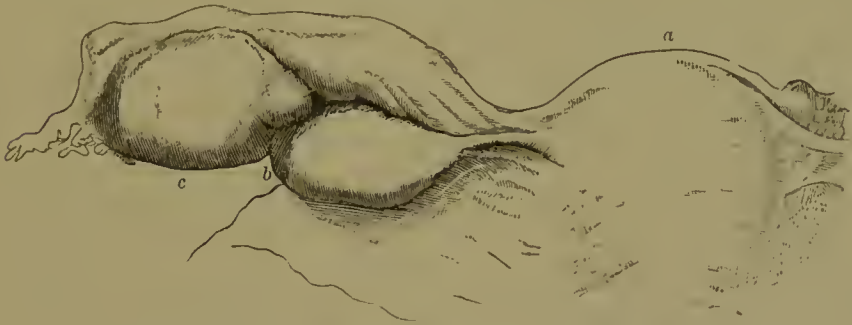
Cyst of the Parovarium : *a*, uterus; *b*, ovary; *c*, tumor (Bantoek).

no reason why two or more of the tubular relics of the Wolffian body should not undergo dropsical distension at the same time and from the same cause, forming by their growth a single tumor having a corresponding number of loculi : that this should be of comparatively rare occurrence, however, can be easily understood when the actual condition of these atrophied remains is considered. Bantock[1] describes such a parovarian tumor, composed of two cysts, which was removed by Wells, each of the component sacs being filled with limpid, slightly opalescent fluid. Another instance of polycystic tumor of the parovarium occurred in the practice of Mr. Lawson Tait.[2] The patient was a widow aged sixty-six, suffering from what was deemed a unilocular Wolffian cyst. Upon operating, however, the tumor, which sprang from the parovarium and involved neither tube nor ovary, was found to be made up of five or six sacs, the walls of which were so thin as to resemble tissue-paper. In point of size the cystic tumors of the broad ligament differ greatly, most being quite minute, others medium, while a few are of considerable bulk. Thus, Thomas is in possession of a cyst, dried and stuffed with cotton, which measures twenty-six inches in circumference ; this, though, is by no means the largest on record.[3] While exceptions occasionally occur, the cyst-wall is very thin, as a rule ; and in any case the thickness is uniform. It is formed of a layer of fibrous tissue containing smooth muscle-fibres (Spiegel-

[1] "On the Pathology of Certain So-called Unilocular Ovarian Cysts," *Trans. of Lond. Obstet. Soc.*, vol. xv., 1873.

[2] *Op. cit.*, Amer. ed., p. 166.

[3] Courty (*op. cit.*, Amer. ed., p. 744) removed nearly fifty quarts of fluid from what he had every reason to suppose was an enormous cyst of the broad ligament.

berg, Fischel), while the outer surface of the wall is covered with peritoneum. Within is a layer of ciliated or columnar epithelium, in the case of most Wolffian cysts; though those of the efferent tube of the parovarium, as well as other simple broad-ligament cysts, are lined with flat pavement cells, according to Doran. The peritoneal coat, with its fine tracery of delicate blood-vessels, imparts a greenish-white hue to the exposed cyst, and is generally quite movable upon the subjacent stratum of fibrillar connective tissue. The latter fact renders feasible the removal of parovarian cysts by enucleation, the treatment first employed by Miner[1] in the case of ovarian tumors. By incising the serous covering, the cystic tubule may be shelled out of the broad ligament; though, for various reasons, the range of this operation is quite limited. In the first place, even when the tumor is sessile, a good pedicle may usually be formed by traction, and, should the growth be of moderate size, its removal by ligation may be effected, as suggested by Tait,[2] without the simultaneous ablation of either tube or ovary; again, the frailty of the wall may render enucleation impracticable; or, finally, this measure may be defeated by the deep subserous development of the cyst, which necessitates its separation from the pelvic and abdominal viscera.

The contents of these cysts of the broad ligament usually comprise a thin, limpid, colorless, and generally opalescent, watery fluid, having a low specific gravity, averaging about 1005; a faintly alkaline reaction; little or no albumen or paralbumen; and, finally, very few formed elements. In some exceptional instances, however, the usual proportion of organic and inorganic solid matters present increases from about 2 or $2\frac{1}{2}$ to 8 per cent., and even more; the specific gravity may exceed 1030; the contents may be thick, opaque, tough, and discolored, resembling the colloid of ovarian cysts; while blood may be present in the form of clots or uniformly diffused through the fluid; the result of torsion, puncture, or papillomatous growths. As these tumors of the broad ligament develop in a posterior direction, they separate the serous layers of the mesosalpinx, till finally this fold is entirely obliterated and the tube becomes to a greater or less extent incorporated with the cyst-wall, lying between its peritoneal and fibrous coats, where it can easily be seen and felt. While the infundibulum may remain somewhat movable, it is usually closely attached to the tumor; and even the fimbriæ, their folds being effaced by the same stretching process, radiate from the widely-dilated ostium in intimate connection with the cyst. In this way, the infundibulum being on the outer and posterior aspect of the tumor, the tube is stretched across its anterior surface, sometimes measuring twelve, or even sixteen, inches in length. The tubal digitations are also lengthened, the ovarian fimbria being at times four inches

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[1] *Buffalo Medical and Surgical Journal*, 1869, p. 420.   [2] *Op. cit.*, p. 165.

long. While the tube is rendered somewhat more slender by the traction to which it is subjected, its lumen is not obliterated or even stenosed as a rule; indeed, its abdominal orifice may be so dilated as to admit the tip of one's finger. According to Bantoek, the stretching of the tube across the anterior face of the cyst is due to the fact that the tuboovarian fold and uterus oppose the further lateral unfolding of the broad ligament by the growing tumor; and, inasmuch as these represent the respective attachments of the outer and inner ends of the tube, a greater separation of these points by the enlarging cyst would necessarily mean the stretching of the intervening oviduct. "Thus," says Bantoek, "the tube may be likened to an elastic band half encircling an elastic bag to which its ends are attached."

The ovary is generally unaffected, lying below the cyst and separated by it from the tube (Pl. IV. Fig. 5). Should the tumor in its intraligamentous development pass below the ovary, however, the latter projects from its lower and posterior wall somewhat as the tube does from its upper and anterior. When the cyst becomes very large and tense, the ovary may be crowded down into Douglas' cul-de-sae, or rendered so narrow and thin by stretching as to be quite overlooked. At times its identity is disclosed by the detection of Graafian follicles in sections made through a thickened area of the cyst-wall which represents its probable site. While the development of such a tumor in a posterior or anterior direction, and at the expense of the corresponding serous layer of the broad ligament, is well illustrated in Pl. IV. by Figs. 7 and 8 respectively, the relations of the growth to ovary and tube are not in accord with the foregoing descriptions, particularly in the former instance. In each case the mesosalpinx should be represented as more or less unfolded, while in Fig. 7 of the plate the cyst should protrude between the tube and ovary, rather than below the latter organ. Cysts of the broad ligament occur with special frequency during the period of sexual activity; and their growth is extremely slow, both primarily and after rupture or puncture. The latter fact has doubtless tended to swell the list of cases in which a radical cure has followed tapping or electrical treatment; and it is probable that many of these alleged recoveries have been followed by the reappearance of the disease in the course of months or years. Rupture of these tumors, both spontaneous and traumatic, is of frequent occurrence, but is seldom followed by symptoms of peritoneal irritation, the bland fluid being quickly absorbed and afterward eliminated, largely through the urinary organs. Inflammation of the cyst-wall, on the other hand, is quite unusual; while the extra-peritoneal development of the tumors and the absence of a suitable pedicle protect them wellnigh, though not entirely, from torsion and its effects. In short, the conditions which favor the supervention of adhesive peritonitis to such an extent in the case of the ovarian

cystomata are now almost inoperative; and for that reason it is extremely seldom that parovarian or other cysts of the broad ligament, even those of the largest size, are found adherent to any of the adjacent structures.

Finally, to recapitulate, the following are some of the major points of distinction between cysts of the broad ligament, commonly denominated "parovarian," and those of ovarian origin, though in exceptional instances, as we have seen, they are not entirely applicable:[1]

EXTRA-OVARIAN.	OVARIAN.
Peritoneal coat easily stripped off.	*Peritoneal coat* cannot be stripped off.
Ovary usually healthy, and discharging its functions.	*Ovary* always diseased, and not discharging its functions.
Tumor most frequently unilocular.	*Tumor* always multilocular.
Fluid limpid, opalescent.	*Fluid* viscid, greenish, or brownish.
Specific gravity very low, never exceeding 1010.	*Specific gravity* always exceeding 1010.
Mucin scanty.	*Mucin* abundant.
Colloid always absent.	*Colloid* most frequently present.
Fallopian tube almost invariably attached, and stretched to several times its normal length.	*Fallopian tube* most frequently separate, seldom increased in length, and never exceeding six to eight inches.

TUBO-OVARIAN CYSTS.

It is fitting at this point to say a few words concerning a peculiar cystic formation which occasionally comes under the observation of the surgeon and the pathologist, and is, in its general outline, more or less forcibly suggestive of that familiar form of chemical apparatus known as a retort. In this case, however, the bulb is represented by an ovarian cyst, the curved beak or stem by the communicating Fallopian tube; and it was in recognition of its compound structure that Ad. Richard,[2] who first described this form of tumor, bestowed upon it the name tubo-ovarian cyst (*kyste tubo-ovarien*). By such a cyst, then, we understand one whose walls are formed partly by the tube, partly by the ovary, though the bulk of the tumor is always furnished by the latter organ.

As we shall see in discussing the genesis of these interesting cysts, the abdominal orifice of the tube is closed during the early stage of their formation; and, just as in the case of uncomplicated tubal dropsy, the secretions of the oviduct accumulate on the proximal side of the obstruction and gradually distend the tube toward its uterine orifice.

[1] Bantock: *op. cit.*

[2] "Sur la communication des certains kystes de l'ovaire dans la trompe utérine." *Mémoires de la Société de Chirurgie*, tome iii., 1853; also *Bulletin de l'Académie de Médecine*, 1856, p. 356. Comp. Labbé: *Bull. de la Soc. anat. de Paris*, Mai, 1857.

Should the fluid finally reach the latter opening, it gushes into the uterus and is discharged *per vaginam,* the pressure of the abdominal walls maintaining the flow till the tube and any ovarian cyst with which it may have become connected are emptied. Such evacuations may take place from time to time, and occasionally occur at somewhat regular intervals, constituting the condition known as *hydrops ovariorum profluens.*[1] Boinet[2] describes an interesting case in which a tubo-ovarian cyst was thus drained; and a similar experience has fallen to the lot of both Wells and Anderson.[3] The latter surgeon had appointed a date on which he purposed to relieve the sufferings of his patient by tapping; but, ere the hour set for the operation had arrived, the woman apprised him of the fact that her distress had vanished, in consequence of a profuse flow of urine. The patient's death, which took place suddenly some six months later during an attack of pulmonary hemorrhage, enabled Mr. Anderson to ascertain the fact that a large cyst, having thick walls and including some secondary sacs, was lying collapsed and loose in the abdominal cavity. When opened it was found that the empty sac communicated freely with the Fallopian tube, uterus, and vagina.

Instead of being distended throughout its entire length, however, only the outer or distal portion of the tube is usually thus affected in the case of tubo-ovarian cysts; while at times the enlarged and lengthened oviduct, being firmly attached along its lower border to the fixed broad ligament, pursues a tortuous course. The ovarian portion of the tumor, on the other hand, may be formed by a dropsical follicle, a corpus luteum which has undergone cystic change, or by an ordinary proliferating cystoma, the main cyst usually communicating with the tube in the latter case. Thus, while the cyst is usually unilocular, this is not always the case; and even Richard, in describing one of the eleven cases of tubo-ovarian cysts which came under his observation, says: "La poche ovarienne n'était pas très considérable, elle etait multiloculaire." Similar cases, in which the dilated abdominal extremity of the tube opened into one of the loculi of an ovarian cystoma have come under the observation of Rokitansky,[4] Hildebrandt, Richard, Blasius, Olshausen, Burnier, and Lober. In point of size, tubo-ovarian cysts vary markedly. While their dimensions are moderate in most instances, they may equal in bulk the uterus at term.[5] Both ovaries and tubes may be affected; though this is quite exceptional, the disease being unilateral in the great majority of instances. As to the frequency of their

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[1] *Vide* Blasius: *Commentatio de hydrope ovariorum profluente,* Halæ, 1834.

[2] "Maladies des Ovaires," *Arch. générales,* 1874.

[3] Quoted by Wells, *op. cit.,* p. 35.

[4] "Ueber Abnormitäten des Corpus luteum," *Allgem. Wien. med. Zeit.,* Aug. 30, 1859.

[5] *Vide* Hildebrandt: *Die neue gynäkologische Universitätsklinik und Hebammen-Lehranstalt zu Königsberg,* Leipzig, 1876, S. 109.

occurrence, Olshausen states that he has met with tubo-ovarian cysts three times in performing three hundred ovariotomies, the tumor being bilateral in one instance.

The point at which the union between the oviduct and ovarian cyst occurred is generally marked by a more or less constricted annular aperture, through which the mucous lining of the tube becomes continuous with that of the ovarian cavity. The fimbriæ may have disappeared entirely, or in some cases they are seen spreading over the outer surface of the cyst-wall. Usually, however, they appear upon the inner surface as radiating continuations of the longitudinal tubal folds of mucous membrane, and may almost meet at the opposite pole of the cyst; or they float freely in the fluid contents of the tumor. In one case, described by Burnier, the ends of the fimbriæ alone were attached to the inner surface of the cyst, the central portions remaining free.[1]

Excepting the more or less limited area formed by the extra-peritoneal portion of the ovary, the outer surface of a tubo-ovarian cyst is covered by the peritoneum. The wall of the tubal portion is largely made up of smooth muscular fibres; though, when the distension is considerable, these are forced asunder and tend to disappear. Upon the inner surface is a layer of ciliated columnar epithelium; that is, in the early stages of the disease. Later, however, the cilia vanish; and, just as in the case of the ovary, the cellular lining changes from the columnar to the squamous type in consequence of the increasing pressure of the fluid contents. The histology of the ovarian portion of the cyst has already been discussed at length.

The contents of tubo-ovarian cysts are by no means of a uniform character: they vary with the nature of the ovarian component, the occurrence of hemorrhage, suppuration, and other changes. A thin, limpid serum containing few morphological elements may be present; or the fluid may be quite thick, and of any shade, ranging from a light yellow to a deep chocolate, the different colors being due to the presence of epithelial cells, pus, and blood. Sometimes the blood is found in a fresh state; again, it forms grumous masses, or clumps of pigment and hæmatoidin crystals may alone attest the fact that hemorrhage has occurred in the past.

Genesis.—The endeavor to account for the origin of tubo-ovarian cysts has led to the advancement of various theories; but of these no single one is found to be universally applicable, and it becomes more and more evident that to explain the genesis of these tumors in a satisfactory manner necessitates the adoption of several distinct views, which it will be impossible to discuss thoroughly in the present article.

[1] *Vide* Burnier: "Ueber Tubo-ovarialcysten," *Dissert. inaug.*, 1880; also, "Zwei neue Fälle von Tubo-ovarialcysten," *Zeitschr. f. Geb. u. Gyn.*, Bd. vi. S. 87.

According to Richard, the ovary is clasped by the fimbriated extremity of the Fallopian tube; the ovum and fluid contents of the ripe ovisac are discharged into the ostium abdominale; but, in consequence of some morbific agency, the normal course of events is then interrupted. Instead of closing and forming a corpus luteum, the diseased follicle remains open, and continues to pour into the tube the morbid fluid with which it is distended; that is, the follicle becomes converted into an ovarian cyst, which, with the distal extremity of the attached oviduct, constantly increases in size. In this manner a tubo-ovarian cyst is formed. While indorsing Richard's theory on the whole, Klob directed attention to the fact that the ovarian portion of the cyst is always much larger than the tubal; although the dense ovary would seemingly be much slower to yield to the increasing pressure of the fluid within the common cavity than would the tube. In order to overcome this objection, Klob suggested as a possibility that an ovarian cyst develops from a corpus luteum, and bursts into the end of the adherent tube. But to secure this firm union between the abdominal orifice of the tube and the ovary before the bursting of the cyst, a circumscribed peritonitis at least must be present; and, should this be admitted in the case of Klob's cystic corpus luteum, it would also be true, as Burnier claims, of other cystomata, regardless of their histogenetical differences. Lober attempts to reconcile this latter assumption with Richard's original theory in two ways:[1] first, a tubo-ovarian cyst having formed from the rupture of a ripe ovisae into the adherent tube, other Graafian vesicles become dropsical, and finally we have the ovary converted into a multiple cystoma of Rokitansky (see Fig. 324); second, a multilocular ovarian cystoma forms, and subsequently a follicle in an uninjured portion of the organ reaches maturity, is grasped by the fimbriated extremity of the tube, bursts, and then unites with the latter organ to form a tubo-ovarian cyst.

But Richard's assumption, that the ovary is embraced by the morsus diaboli when a follicle ruptures, is disputed by many competent authorities; and Veit,[2] who was the first to oppose the former's views, declares that this active co-operation of the oviduct has never been observed, and that the above theory fails to account satisfactorily for the presence of fimbriæ upon the inner surface of the cyst, their most common location. Veit assumes, instead, that the disease begins as a catarrh of the tube and Graafian follicle, in consequence of which the two organs become firmly united, and that these two contiguous cavities subsequently communicate with each other. This is the so-called "catarrhal theory," which, with certain modifications, is now widely accepted.

The results of a catarrhal salpingitis vary with the seat of the dis-

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[1] Consult Lober: "Doppelseitige Tubo-ovarialcysten," *Inaug. Dissert.*, Berlin, 1886.
[2] *Krankh. d. weibl. Geschlechtsorg.*, Erlangen, 1867, S. 481.

case. In the uterine and middle portions a simple narrowing of the lumen is the usual consequence; but, when the inflammation reaches the infundibulum, a complete closure of the abdominal orifice is frequently effected by the union of the fimbriæ. The inner surfaces of these laciniæ are covered with columnar epithelium, and so cannot unite until deprived of their cellular coating; but upon the opposite sides is a layer of peritoneum, and we know that serous surfaces are prone to adhere. In the course of an inflammation involving these parts, then, the fimbriæ, with the exception of the fimbria ovarica, bend inward till their extremities point toward the uterus, and they seem about to enter the tube itself. Now their serous surfaces are apposed and unite, so that the abdominal orifice of the tube is closed. This inward bending of the fimbriæ is ascribed, in part at least, to the action of their muscular fibres by Reboul,[1] the muscular contractions being excited by the irritating effects of the inflammation. Should fluid now collect in the tube, its outward pressure results in the partial protrusion of the inverted fimbriæ; so that the end of the tube presents a rosette-like appearance, there being in the middle a funnel-shaped depression surrounded by small nodular elevations. The adhesion of such an inflamed and occluded tube-end to a growing ovarian cyst of any kind, followed by the communication of the two diseased sacs in consequence of pressure-atrophy and distension, would result in the formation of a tubo-ovarian cyst. The fimbriæ, being liberated by the tension of the more rapidly-enlarging ovarian cyst, would tend to invade its cavity, and either float freely in its fluid contents or become more or less adherent to its walls. In Reboul's opinion the inflammatory changes in these cases involve the tube first, the ovary next: should the direction of the inflammation be reversed, proceeding from the ovary to the tube, a tubo-ovarian cyst rarely results.

The various theories which we have thus far considered attribute the genesis of tubo-ovarian cysts to changes occurring after birth, but they fail to account satisfactorily for all cases. Thus, in some instances the fimbriæ are entirely absent, no traces of them appearing outside of or within the cysts; while at the same time it is evident that inflammation has never been present in the affected region. To explain the intimate fusion of tube and ovary in such cases, both Schneidemühl and Beancamp, who investigated the question independently of each other and announced their conclusions in 1883 and 1884 respectively, assumed a faulty intra-uterine development (vitium primæ formationis). The former believes that at an early period of embryonic life the tube fails to open into the abdominal cavity, but becomes merged in the ovary; while Beancamp, expressing the same idea in different words, assumes the formation of an " ovarian tube," by which he understands one whose

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[1] "Ueber Tubo-ovarialcysten," *Dissert. inaug.*, Berlin, 1885.

abdominal end is so fused with the corresponding ovary that no sharp-ly-defined line of demarcation exists between the two organs, the tube being closed by the ovary itself. Concerning the changes which result in the formation of a tubo-ovarian cyst from such an undeveloped ovi-duct, neither of these investigators seems to entertain very clear ideas; Reboul, however, is more satisfactory in this respect. The latter, in describing the formation of such a cyst, assumes primarily the existence of a "congenital ovarian tube," though one has never been actually seen. The next essential appears to be a cystic or cystoid degeneration of the ovary, followed by dropsy of the distal portion of the tube. Finally, the septum intervening between the ovarian cyst and the lumen of the tube becomes perforated and is completely absorbed, though whether the erosion takes place on the tubal or ovarian side of the partition is as yet unsettled.

Beaucamp asserts that ovarian pregnancy may occur in these con-genital cysts, mature ova escaping from surrounding uninjured Graafian follicles into the ovarian cavity, and there becoming fertilized. In all probability the circumscribed peritonitis which causes the union of tube and ovary is frequently the result of gonorrhœal salpingitis; and especially is this true of bilateral tubo-ovarian cysts.

DERMOID CYSTS OF THE OVARY.

Attached to the surface of the body, or more or less deeply imbedded in it, peculiar congenital formations termed *teratomata* or *teratoid tumors* are occasionally met with, the distinguishing feature of which is the fact that they are compounded of various tissues not normally found in these localities. That is to say, these tumors are heterologous —not in the limited sense which justifies the application of this epithet to chondromata of the testis, ovary, or parotid gland, but from the fact that they may contain not cartilage merely, but fibrous tissue, bone, fat, muscle, glandular structures, skin, hair, nerves, and simple embryonic cellular tissue. At times it is quite evident that such a congenital growth represents an undeveloped fœtus: its shape perhaps, or the presence of rudimentary skeletal and visceral structures, suffices to prove its genesis. In such a case two rudimental embryos have orig-inated in a single ovum; but one twin, attached to and deriving its nutriment from the other, has fallen behind in the race, and its stunted remains form a mere parasitic appendage to the surviving fœtus (auto-site or host), or become surrounded and enclosed by it. The teratoma in such a true double monster, when visible from without, is generally attached to the lower end of the spine, to the head, neck, anterior tho-racic or abdominal wall.

On the other hand, however, the great majority of teratomata differ

in several essential features from the true fœtal monstrosities which we have just considered : their shape is nowise suggestive of an ill-developed human being ; even the rudiments of organs, in the formation of which the hypoblast shares, are generally wanting ; they have a cystic form ; and, finally, their inner lining resembles more or less closely the outer skin, the attributes of which are frequently present. It was to these tumors which form the subject of the present section that Lebert, influenced by their two most constant and characteristic features, gave the name " dermoid cysts." These peculiar formations are found in various parts of the body, as in the orbit, neck, perineum, brain, anterior mediastinum, lungs, mesentery, peritoneum, stomach, kidney, bladder, testicle, scrotum, and other localities ;[1] but it is in the ovary that they occur most frequently, 129 out of 188 dermoid cysts reported by Lebert affecting that organ.

Ovarian dermoids present great variations in point of size, being at times quite minute, while again they may even exceed a man's head in bulk. As a rule, however, the growth of these cysts ceases after a time, and they remain stationary, any further increase in the size of the patient's abdomen being the result of ascites due to the irritating effects of the tumors upon the peritoneum. While but one ovary is usually involved, cases in which both glands are the seat of dermoid cysts are observed with comparative frequency. Thus in 31 cases of this disease observed by Doran, 7 were bilateral, while Olshausen found both ovaries affected in 4 out of 16 operations undertaken for the removal of these growths. Koeberlé's statement, that the right ovary is more frequently involved than its fellow, has not been substantiated by subsequent investigations. The cysts may be either single or multiple, three or more being found in some cases springing from one ovary ; and at times these primary and contemporaneous cysts may communicate with each other, their contiguous walls becoming atrophied from mutual pressure in the manner already described. In no case, however, does true proliferation take place ; the cysts remain simple or unilocular save in certain rare instances of which we shall have occasion to speak later, though even then the exceptions are apparent rather than real.[2]

As to the time which marks the occurrence of dermoid cysts of the ovary, no age is exempt ; they have been found in the fœtus of eight months as well as in the aged. Roemer of Berlin has even operated successfully upon a child aged twenty months, removing an ovarian

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[1] For details consult Meckel, " Mémoires sur les Poils et les Dents qui se développent accidentellement dans le Corps," *Journ. compl. du Dict. des Sciences méd.*, t. iv. pp. 122 et 217.·

[2] It has been claimed by Ritchie (*Ovarian Physiology and Pathology*, London, 1865) that multilocular dermoid tumors are always formed by the secondary growth of partition-walls within the primary unilocular sacs—a view in which Tait concurs.

dermoid as large as the patient's head;[1] while Potter, in examining *post-mortem* the body of a woman eighty-three years old, found a similar growth, which, though weighing eighty-nine ounces, had occasioned no symptoms during life. It appears that up to the period of puberty the dermoid occurs oftener than any other form of ovarian tumor; in the early years of sexual maturity, however, cysts with serous contents, chiefly those of the broad ligament, exceed the former in number; while after the twenty-fifth year the proliferating cystomata predominate. Considered by themselves, however, and not relatively, ovarian dermoids are observed most frequently from the fifteenth to the forty-fifth year of life; that is, during the season of potential reproductiveness. That this is so should excite no surprise; for when one reflects upon the mighty changes, both developmental and functional, which take place in the reproductive organs of the female during this period, it seems but natural that these congenital dermoids of the ovary should respond then, if at all, to the local stimulating influences, and either begin to grow or grow more rapidly. The imperfect development of the genitalia which has been observed quite frequently in the victims of this disease seems to be more than a mere coincidence, and results, in all probability, from the injurious influence exerted upon the ovary by the tumor. Occasionally, however, an opposite condition obtains, markedly precocious children being sometimes afflicted with these growths. While the experiences of the leading operators exhibit great differences in respect to the prevalence of dermoid cysts, it is probable that they comprise from 4 to 5 per cent. of all ovarian tumors.

The bright, glistening appearance presented by the fresh surface of a glandular cystoma is absent in the case of dermoid cysts, a dull and often brownish hue replacing it. Though at times very delicate, the walls of these growths are usually quite thick; while the inner surface is either smooth or raised here and there into prominences of variable height and area, as shown in the accompanying illustration (Fig. 342). These elevated patches, which resemble the outer skin, lie several millimeters above the adjacent parts. The inner lining of the cyst-wall, which corresponds to the epidermis or cuticle, often exceeds two millimeters in thickness, and is composed of epithelial cells agglutinated together in several irregular layers. Of these latter, the uppermost, or that contiguous to the cyst-contents, is made up of large flat cells, the nuclei of which have disappeared; while below nucleated cells of a more rounded or polyhedral form appear. The deepest cuticular stratum, finally, comprises a row of somewhat elongated epithelia placed perpendicularly upon a layer of connective tissue resembling the true skin or corium, between which and the outermost lamina of firm

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[1] See *Lond. Med. Rec.*, June, 1884, or *Deutsche med. Wochenschr.*, Dec., 1883.

fibrous tissue lies the panniculus adiposus. The surface of the so-called corium is frequently, though not invariably, studded with papillæ, which differ from those of the tegumentary investment of the body less in number than in their irregular size, length, and arrangement. The resemblance of the inner cyst-wall to the skin is often still fur-

FIG. 342.

Portion of the Wall of an Ovarian Dermoid Cyst: *a*, wall; *b*, elevations, composed of fatty and cutaneous tissues; *c*, hairs; *d*, teeth (Ziegler).

ther increased by the presence of other attributes of the latter. *Hairs* may spring from the entire surface, though more often their growth is limited to the prominences mentioned above (piliferous cysts). These arise from follicles, and while usually short may range from four or five inches to two feet in length (Coward, Blumenbach); indeed, they may be as long as any ever found upon the scalp (Boinet). There seems to be no connection, in point of color, between the hair within such a cyst and that upon the body, since Andral mentions the case of a negress in whom it was of a blonde and even silvery color. On the other hand, the hair may be darker than that upon the patient's external parts,[1] though usually it is fair or of a reddish cast. Frequently

[1] *Vide* Doran: *op. cit.*, p. 79.

the hairs are soft and fleece-like to the touch—a circumstance which suggested for such tumors the name "trichomallomata."

Sebaceous glands are abundant, opening either normally into the hair-follicles, or beneath the epidermis, as well as upon the inner surface of the cyst. *Sudoriferous glands,* normal in position and structure, have also been observed by Heschl, Kohlrausch, and others; though these are less numerous than the sebaceous variety. But hairs, papillæ, and glands are all wanting in some dermoid cysts, although the sebaceous contents of the tumors prove that glands must have been present at some time in the past. In all probability such a condition of affairs is the result of atrophy—an assumption which the delicate, smooth walls of the cysts, with their thin cuticular linings, serve to strengthen.

Though occurring less frequently than the structures already mentioned, bone, teeth, cartilage, nervous tissue, and both varieties of muscular fibres are also met with in the walls of dermoid cysts.

The *bones* originate as delicate laminæ or spicula in the connective tissue of the cyst-wall beneath the skin-like covering, and assume in the course of their development a variety of irregular shapes. At times they present a marked resemblance to the flat bones of the skull in their rudimentary condition; and when, as is frequently the case, teeth are found imbedded in them, together with empty sockets, their analogy to the jaw-bones is forcibly suggested. While of a genuine osseous structure, the texture of these bones is usually more compact than cancellous. Rarely, two or more pieces are found joined together by capsular structures, the apposed ends having cartilaginous investments. Again, the *cartilage,* which likewise arises in the subdermal connective tissue, may form small tooth-like bodies; or, forcing its way through the lining, it may project into the cavity of the cyst and appear as masses of various sizes covered merely with perichondrium. Portions of the cartilage may be undergoing ossification.

The *teeth,* whose presence constitutes one of the most remarkable features of dermoid cysts, may be attached to bone or cartilage within the cyst-wall, while their crowns extend into its cavity. Sometimes, however, their fangs are surrounded merely by connective tissue; and occasionally the entire tooth lies completely imbedded in the walls, no portion showing save when exposed by an incision. Though well formed and of a distinct type at times, they are usually faulty in point of development, shape, and preservation. They may be rudimentary, the crown, fang, enamel, or cortical substance being absent; while caries may have resulted in their partial destruction. A most striking statement anent the shape of the teeth is made by Olshausen,[1] to whom the idea was first submitted, together with proofs of its correctness, by Prof. Holländer. The former observes that the crowns of teeth found

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[1] "Diseases of the Ovaries," *Cyclop. of Obstet. and Gyn.,* vol. viii.

in these cysts, like those of the oral cavity, slope gently toward the median plane of the body, and that, bearing this fact in mind, an examination of its dental elements suffices to determine upon which side the tumor originated. The importance of this proposition, as far as its bearing upon the etiology of dermoid cysts is concerned, can hardly be exaggerated, and should subsequent investigations determine its truth, the mooted genesis of these tumors will be definitely settled.

While the teeth are usually few in number, ranging from one to ten, this is not always the case. Thus, in three pieces of bone removed from the walls of a large dermoid cyst in the case of a girl thirteen years of age, Schnabel found more than one hundred teeth;[1] and Ploucquet[2] records a case in which they exceeded three hundred in number. When few teeth are present, Doran states that they are usually of a canine or incisor type, the bicuspid form prevailing when the opposite condition obtains. That the teeth of dermoid cysts develop in successive crops, and in many other respects correspond to the normal dental structures, has been shown by the investigations of Meckel, and is corroborated by the experience of others. Thus, a preparation in Rokitansky's collection shows the crown of an atrophied tooth resting upon an underlying growing specimen, in a manner which forcibly recalls the natural eruption of the deciduous and permanent teeth. Wells, too, has observed this phenomena in one of his own cases. That the teeth are supplied with nerves has also been demonstrated.[3]

Nervous tissue, both gray and white, and resembling brain-substance as well as nerve-fibres, has been repeatedly found in these cysts; and the same may be said of plain *muscular fibres*, regarded by Virchow as *arrectores pili*. As to the striated fibres, however, reports are of a conflicting nature. While some deny their occurrence in true dermoid tumors of the ovary, referring such as have been observed to those teratomata which represent blighted fœtal remains, others, supported by the experience of Virchow, maintain that they do appear in the former structures, though with comparative rarity. That the proponents of the latter view are correct, however, must, in our opinion, seem more than probable to any one who acquaints himself with the more recent ideas concerning the genesis of the cysts now under consideration. According to Cruveilhier and Boinet, structures resembling nails are also found in these cysts, though only at long intervals.

The *contents* of dermoid cysts comprise such substances precisely as one versed in the structural anatomy of these growths would expect to meet with. The tumors consist, as we have seen, of closed sacs lined to a greater or less extent with a structure resembling skin and pos-

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[1] Schnabel: *Württemb. Correspondzbl.*, 1841.
[2] Quoted by Becquerel (*Maladies de l' Utérus*).
[3] Salter: *Guy's Hospital Reports*, 1860, p. 241.

sessing the attributes of the latter organ. Hence, when the oily liquid secreted by the epithelium of the sebaceous glands exudes from their ducts, it is not removed by friction and various other detergent processes, as is normally the case, but is stored up within these closed cavities, producing retention-cysts analogous to comedones, milia, and wens (sebaceous), save that the gland-ducts remain perforate. During life this fatty secretion remains in a fluid condition; though in the dead body, or when exposed to the air after ovariotomy, it tends to become firm, and is frequently found in a pultaceous condition. The greasy mass within the sacs, which often resembles the *vernix caseosa*, contains, in addition to this sebaceous fluid, exfoliated epithelium, and cholesterin is frequently present in such abundance that the crystals impart a glittering appearance to the entire contents of the cysts. Oxalic acid, considerable leucin and tyrosin, urea, and a substance resembling xanthin have also been found.[1] Hairs too, either shed from the skin-like lining or still connected with its follicles, are imbedded in the smeary mixture, sometimes radiating through it in a straggling manner, again aggregated into tufts or firm roundish masses. Finally, in the case of dentigerous cysts, some teeth may be found in the same situation, instead of being attached to or imbedded in the walls of the tumor; while, at other times, fragments of bone and various tissues are thus met with. Usually, of course, the fatty contents of these dermoid cysts form a single cohesive mass, but in one instance the following anomalous condition of affairs was observed by Rokitansky: Floating in a brownish viscid fluid were seventy-two round bodies as large as walnuts and composed of fat arranged in concentric layers, while others of the same size were constructed largely of matted hair. Besides these there were present innumerable fatty globules as small as peas. Inasmuch as the pedicle of the tumor was found in a twisted condition, Rokitansky was disposed to ascribe the formation of these peculiar globules to the rotary or churning motion to which the contents of the cyst had been subjected. As Olshausen suggests, however, it is more probable that this result was due to the admixture of blood and serum with the fat. Cases similar to that of Rokitansky have since been reported by Routh, Fraenkel, Doran, and others. On one occasion the last-named observer found in each of two small dermoid cysts, present in a single ovary, a quantity of pure white sebum resembling putty.

In ovarian dermoid disease the sac rarely contains more than eight pints of fluid; and the latter may present any color, ranging from a light brown to a deep chocolate, the darker shades being the result of hemorrhagic effusion.

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[1] *Vide* Bamberg: "Obser. aliquot de ovarii tumor.," *Dissert. inaug.*, Berol., 1864, p. 15.

Genesis.—But how is one to account for the origin of the dermoid cysts of the ovary? This is a query the attempted solution of which has exercised the reason and stimulated the imagination of the profession from the time of Hippocrates down to the present; and nothing in the whole range of ovarian pathology better illustrates modern progress than the evolution of the most widely-accepted theory of to-day from the vague conjectures of the past. To discuss the subject in an exhaustive manner, however, is manifestly impossible: the writer must rather content himself with that brief consideration which the limited space at his disposal necessitates.

In the first place, four leading hypotheses, embracing all others, have been proposed in explanation of the nature of these tumors, and may be stated concisely as follows: first, that dermoid cysts represent the results of the fecundation and limited growth of the ovum in the ovary itself; second, that this restricted development of the ovum *in loco* is quite spontaneous, the male germ taking no part in the process; third, that they are due to fœtal inclusion—*fœtus in fœtu;* and, fourth, that certain misplaced or aberrant embryonic cells grow within the ovary, and there produce these peculiar tissues in accordance with their original destiny. It will be noticed that in the first two instances the ova from which the tumors are supposed to develop are contributed by the patient; while, if we accept the view that every double monster originates in a single ovum, each of the latter two hypotheses is based upon the belief that both the cyst and its victim spring from the same ovarian cell. Let us briefly consider these four propositions seriatim:

1. While it is undoubtedly true that ovarian pregnancy does occur, and that the early death and partial absorption of the embryo might account for the existence of a dermoid cyst, still it is quite evident that such a case must constitute a rare exception. Besides, the occurrence of these growths in the male as well as in the female, in the infant as well as in the aged, in the single as well as in the married, shows that this first theory is quite untenable, though Cruveilhier thought it applicable in the case of married women. Coley and Meckel, on the other hand, claim that in adult females these pilous cysts are the result of incomplete fecundation.

2. After the maturation of an ovum, and the subsequent fertilization by one or more spermatozoa, its ability to form the various structures of the body in all their perfection is of course unquestioned. But cannot the ovum under certain conditions, the nature of which is unknown, pass through the earliest stages of development and form rudimentary masses of definite tissues without the agency of the male cell? Such spontaneous developmental energy when exhibited by an ovum has been termed the *nisus formativus* (Blumenbach), or hyperechesis; while the termination of these ovicular efforts in the production of a

perfectly-formed or viable embryo would be an instance of partheno-
genesis (Gr. παρθένος, virgin, and γένεσις, birth), or *Lucina sine con-
cubitu*. The possibility of an ovum thus undergoing partial develop-
ment and forming dermoid cysts has long been recognized by the older
authors. Thus, in Dr. Ashwell's opinion,[1] these growths form as a
result of disappointed sexual appetite, the power of production being
present in the female without receiving the stimulus of the male, and
hence she throws off an imperfect production. Ritchie also regards
every dermoid cyst of the ovary as a "perverted attempt at partheno-
genesis;" and his views are taken up and enlarged upon by Tait, who,
if not the only supporter of this doctrine among living ovariotomists,
is certainly its most devoted advocate. Aside from the fact that no
direct proof of its truth exists, however, this theory of the hyper-
echetic development of an ovum necessitates a genetical distinction
between ovarian dermoid cysts and the subcutaneous variety, while it
utterly fails to explain why, next to the ovary, the testis is the most
frequent seat of these growths (Rindfleisch).

A view somewhat analogous to that which we have just considered
is entertained by Waldeyer.[2] This observer believes that the epithelial
cells of the ovary—which, from the fact that they are derived from the
same germinal epithelium, are the genetical co-ordinates of the ova—
may under certain circumstances produce the various tissues found in
dermoid cysts. According to this theory the proliferation of the ova-
rian epithelium may result in the formation of an ordinary cystoma,
a dermoid cyst, or possibly in carcinoma. While this hypothesis
accounts very satisfactorily for the frequent occurrence of mixed tumors
of the ovary, it is open to the same objections as the preceding.[3]

3. The doctrine of foetal inclusion assumes that the rudimental
embryo in a fecundated ovum undergoes complete cleavage, but that
the formation of homologous twins is prevented by the unequal de-
velopment of the two segments, a double monstrosity being produced
instead. The connection of the blighted individual to the developed
twin, however, is not symmetrical, in accordance with the general laws
of teratology; but the parasite is included within the body of the host
or autosite, giving rise to an ovarian dermoid cyst when attached to
or imbedded in that gland ("*Kystes fœtaux par inclusion*," Boinet).
In so far as this hypothesis refers the origin of every dermoid cyst
to the embryonic period of life, it is satisfactory; but, while admitting
that such a true teratoma may occasionally develop in this out-of-the-

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[1] Quoted by T. S. Lee: *Tumors of the Uterus and its Appendages*, London, 1847.

[2] *Arch. f. Gynäk.*, Bd. i. S. 252.

[3] Waldeyer's position would certainly have been strengthened had the two incipient
dermoid cysts discovered by Doran (*op. cit.*, p. 77) proved upon examination to be
dilated Graafian follicles.

way organ, a moment's thought will convince any one that the explanation does not harmonize with known facts. How shall we thus account in a satisfactory manner for bilateral or multiple dermoid cysts of the ovaries? for the much greater frequency of these tumors in the female? for the evident disposition of the rudimentary fœtus to terminate its career in the ovary or testis? and, finally, for the rarity of hypoblastic structures?

4. The difficulties which beset the first three hypotheses, rendering them inapplicable save in special instances, are successfully met and overcome by the fourth. Cohnheim, in attempting to explain the etiology of tumors, was led to attribute them to developmental faults, and advanced his hypothesis of " embryonic remains." This is to the effect that more cells being produced than are required for the formation of a part, the superfluous ones remain in an embryonic condition, at one point or scattered over an entire tissue. Such cells continue in a " resting " state till roused into growth by some special stimulus. Heschl first accounted for the genesis of superficial or subcutaneous dermoid cysts in an analogous manner. He maintained that portions of the epiblast became invaginated or dipped down from the surface, were then separated by the constricting force of the surrounding growing tissues, and later developed into dermoid tumors. When it was afterward demonstrated by His,[1] however, that the axis-cord from which the genital gland develops is made up of a mass of embryonic cells in which it is impossible to distinguish any individual blastodermic layer, then the theory of Heschl became applicable to dermoid cysts of the ovary as well as to the more superficial variety. Accordingly, it is now believed that in the collection of mesoblastic cells destined to form the ovary other embryonic cells from the future epiblast, surrounding mesoblast, and perhaps hypoblast, may become included. Of these three varieties, the epiblastic cells, from which the skin and its attributes, as well as the nervous tissue, are developed, are most apt to be thus misplaced—because of their exposed position probably. Next in frequency occur cells from the adjacent mesoblast, destined to form bone, cartilage, muscle, and other tissues. Rarest of all, however, are the deep cells from the future hypoblast, to which any intestinal or glandular rudiments in the cyst are to be ascribed. Such components of a potential dermoid cyst of the ovary may remain in a resting condition throughout life; they may yield to the vigorous formative forces of the fœtal or early extra-uterine periods, or their growth may be deferred till they are subjected to the powerful recurrent stimulus of menstrual congestion.

It is sometimes found that a dermoid cyst in one ovary is associated with a proliferating cystoma in its fellow-gland. Doran met with this

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[1] *Untersuch. über die erste Anlage des Wirbelthierleibes,* Leipzig, 1868.

condition three times in thirty-one cases of dermoid disease. Again, a single ovary may be the seat of a mixed tumor, made up of a combined dermoid and glandular cystoma. Numbers of such cases have been observed by Schroeder, Eichwald, Martin, Wells, Olshausen, Doran, and others. In most of these the dermoid cyst formed but a single loculus of the larger cystoma; and, in all probability, the latter was a secondary growth caused by the irritating qualities of the former congenital cyst. Occasionally the dermoid sac has apparently opened into one of the contiguous colloid cavities, for the skin-like lining of the former is directly continuous with the ordinary single layer of cylindrical epithelium. Here, of course, the contents would be partly colloid, partly those of dermoid cysts. A very accurate histological study of such a case has been made by Flesch.[1]

In an ovarian tumor of considerable size, and apparently multilocular, a peculiar condition was observed by Friedländer.[2] The growth comprised numerous cysts, grouped together in an irregular manner, some of which contained sebaceous material, some a clear serous fluid. Upon examination it was found that the neoplasm represented a dermoid cyst in which secondary changes of an extraordinary character had taken place, though the main cavity was filled with the usual mass of greasy material mixed with hair. Sudoriferous glands had been converted into retention-cysts, as large as one's fist; while other sacs of various sizes were sebaceous glands, distended by their retained secretions. In combination with a dermoid cyst there may be present various other pathological conditions: the stroma is found in a degenerate state, or malignant neoplasms form more or less of the whole tumor. Thus, in a case of bilateral dermoid disease of the ovaries Kocher found that medullary carcinoma was present in one of the tumors, while unilateral cancerous cysts are described by Heschl and Wahl. In the latter's case the extension of the malignant disease necessitated the resection of the colon. The stroma, however, is much more frequently involved than the epithelial structures, and hence the majority of malignant growths attacking dermoid cysts are sarcomata. Flaischlen,[3] in examining an ovarian tumor removed by Schroeder, found it to be of a mixed type—a dermoid cyst in combination with a proliferating cystoma: the connective tissue had undergone sarcomatous degeneration. Round-celled sarcomata have also been observed in connection with dermoid cysts by Unverricht, Doran, Thornton, and others; while, in one of Bantock's cases, dark-red, firm sarcomatous masses, composed of both spindle-shaped and round cells, were found by Doran. Thornton has in several instances noticed the appearance of malignant disease in the pelvis two or three years after

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[1] *Verhandl. d. physikal.-med. Gesellsch. in Würzburg,* Bd. iii. S. 111.
[2] See *Virch. Arch.,* Bd. lvi. [3] *Zeitschr. f. Geb. u Gyn.,* Bd. vii. S. 449.

the removal of large dermoid cysts, in which soft, whitish masses resembling sarcomata had been present (Fig. 343).

As in the case of glandular and papillary cystomata, peritoneal metastases have been reported by several observers in connection with dermoid ovarian disease. The secondary cysts usually appear as small yellowish nodules with characteristic contents, though the precise method of their dissemination, whether through rupture of the primary ovarian growth or otherwise, is not known.
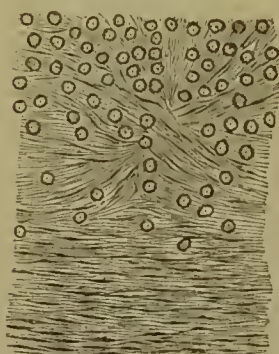
When provided with suitable pedicles, dermoid cysts are especially apt to rotate, their moderate size and firm consistence favoring the occurrence of this accident. Again, their protracted stay in the pelvis renders them more liable to injuries of all kinds, particularly to the pressure and contusions incident to pregnancy and parturition. It is to such unfavorable conditions, doubtless, that the special frequency of inflammation, suppuration, and even gangrene, in these cysts is to be ascribed. The inflammation results in the formation of adhesions, and may subside; but should it assume a suppurative or gangrenous character, death follows from exhaustion unless spontaneous rupture at a favorable point, or operative interference, affords the necessary relief. If the cyst ruptures into the abdominal cavity, as it occasionally does, an acute diffuse peritonitis usually affects a lethal issue in a short time; fortunately, however, the preceding adhesive peritonitis generally averts such a result. Perforation occurs oftenest into the rectum or vagina, the most favorable routes for the escape of the purulent cyst-contents; though at times an outlet is provided through the abdominal wall. The appearance of hairs in the urine (pilimiction), together with pus and fat, announces that rupture into the bladder has taken place; but, from the inaccessibility of the fistulous opening into the cyst, the limited permeability of the urethra for masses of hair and other solid contents of the sac, as well as from the added danger of purulent cystitis, such an occurrence is to be classed among the least auspicious.

FIG. 343.

Round-celled Sarcoma from a Dermoid Cyst, showing the transition from the connective tissue of the firmer portion of the tumor to the collection of round cells, with a trace of fibrillation of the intercellular substance in the softer part of the growth (Doran).

FIBROMA AND CYSTO-FIBROMA OF THE OVARY.

While fibrous tumors of the ovary are by no means numerous, they are certainly not so rare as the literature of the subject would lead one to suppose; for it is doubtless true that under this head should have

been included many neoplasms of an alleged sarcomatous or myomatous nature, the cellular elements of which were identical with those of the normal ovarian stroma. It must be confessed, however, that the erroneous classification in such cases, as well as the widespread uncertainty concerning ovarian fibromata, which finds expression in the multiplicity of opinions advanced by the various writers on the subject, is merely what one would naturally expect under the circumstances, and admits of a simple explanation. In discussing the structural elements of the ovary we have already referred to the numerous spindle-shaped cells which enter so largely into the composition of the stroma, the other and chief component being a fine connective tissue. One group of distinguished and competent histologists, as we have seen, regard these cells as organic muscle-fibres, His even assuming that the whole of the stroma represented merely the hyperplastic *tunicæ mediæ* of the arteries, the adventitial layer of connective tissue being entirely wanting in the vessels of this organ. Others, again—and, as it seems to the writer, with more reason—affirm that the spindle-cells represent connective tissue in its immature form. True smooth muscular fibres do, however, enter the ovarian hilum from the broad ligament in connection with the blood-vessels, and perhaps others are contributed by the ovarian ligament, though Frey evidently deems them of too little importance to deserve mention (*Das Mikroscop*), while Fritsch scouts the idea that they could ever develop a myoma. Between these normal tissues of the ovary and the histological constituents of the fibromata a close resemblance frequently exists, though, from the changeable nature of the latter, the connection is not always so evident. The intercellular, or ground, substance of the tumors varies in amount, density, and arrangement, while the cells may be few or abundant. It is the presence of these very connective-tissue spindle-cells, however, which has frequently caused a true fibrous growth of the ovary to be regarded as a sarcoma, fibro-sarcoma, or cysto-sarcoma; and their microscopic resemblance to the muscular elements of the uterus often renders a differential diagnosis between ovarian and uterine fibroids a difficult, if not an impossible, task.

But do smooth muscular fibres ever occur in true ovarian fibromata? This question, which has evoked a most earnest discussion, has been answered in the affirmative by most pathologists, including Virchow, Birch-Hirschfeld, Klob, and Klebs, all agreeing that they are occasionally present in limited numbers, though Virchow intimates that, because of the difficulty with which small and slightly-developed or atrophic muscle-cells are distinguished from connective-tissue corpuscles, this scarcity may be only apparent.[1] Others, on the contrary, maintain with Leopold, Fritsch, and Spiegelberg, that the ovarian fibroma is

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[1] *Vide* Virchow: *op. cit.*, Bd. iii. 1ste Hälfte, S. 223.

always pure, and that a myofibroma in that situation must spring from the broad ligament or uterus. It is certainly easy to understand how a subperitoneal uterine fibroid, developing outward between the folds of the broad ligament, may cause the absorption of the ovary through pressure or become incorporated with that gland, while its connection with the uterus is either preserved or severed. The final solution of this vexed question is hindered, however, by the fact that even in the dead body it may prove extremely difficult to decide positively whether a fibroid which occupies the site of an ovary originated in that organ or in the uterus.

But, to return to the occurrence of these tumors, Tait makes the following remarkable statement: " Growth of the fibrous stroma of the ovary, so as to form a large abdominal tumor requiring removal, has not yet been described, so far as I have been able to discover;" and, in a comparatively recent personal interview with this distinguished author, the writer was confidently referred to Greig Smith's then forth-coming work on " Abdominal Surgery," for additional testimony to the same effect. Instead of corroborating Tait's assertion, however, Smith refutes it directly, by citing as a personal experience the successful removal of a " solid ovarian tumor as large as a child's head, in which repeated examinations by competent histologists failed to show any other histological element than pure fibrous tissue."[1]

Olshausen mentions the finding of six fibromata in 293 of his cases of ovarian disease; Leopold tabulates 59 cases;[2] while Coe has not only convinced himself of the genuineness of reported fibrous tumors in more than twenty instances, but claims that he has occasion to examine two or three undoubted specimens in the course of each year.[3] These tumors are of slow growth, and usually affect a single ovary, though Leopold asserts that in three out of every sixteen cases the disease is bilateral. As for the age of the victims, it has been found that young women are most frequently thus afflicted. In point of size the tumors vary between wide limits. Thomas mentions the removal of a genuine fibroma which equalled the head of the largest man in its dimensions; Simpson found one weighing fifty-six pounds; while Spiegelberg describes an enormous fibroid sixty-six pounds in weight, the patient's abdomen being so distended as to measure forty-one inches in length and sixty inches in its greatest circumference.[4] These are exceptional cases, however, and almost always fibro-cysts:

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[1] J. Greig Smith : *op. cit.*, p. 130.

[2] *Vide* Leopold : " Die solid, Geschev. d. Ovar," *Arch. f. Gyn.*, Bd. vi. H. 2, und Bd. xiii. S. 155.

[3] The reader is advised to consult Coe's able monograph in the *Amer. Journ. of Obstet.*, vol. xv. p. 561.

[4] Consult Spiegelberg: *Monatsschr. f. Geb.*, Bd. xxviii. S. 415.

the great majority of fibrous ovarian tumors are much smaller, resembling an egg or an orange in bulk.

A long and slender pedicle, representing the mesovarium, usually connects these growths with the posterior surface of the broad ligament. Sometimes, however, the attachment is short and broad, and, in exceptional instances, the tumor may invade the intra-ligamentous connective tissue and become sessile.

While the whole ovary may have disappeared, it is more frequently the case that a portion only of the gland is the seat of the neoplasm, and usually it is the end farthest from the uterus which is thus affected. Though the balance of the ovary is still recognizable, it very often exhibits all the changes produced by chronic ovaritis. The stroma may be indurated and hyperplastic, the follicles transformed into corpora fibrosa.

Fig. 344.

A Fibroma of the Ovary.[1]

These ovarian fibromata form roundish masses having smooth, nodular, or lobulated surfaces; and, as they present a shining appearance, their resemblance to the subserous fibroids of the uterus is quite marked. Unlike the latter, however, they cannot be shelled out of the surrounding tissues, being more or less intimately incorporated with the rest of the gland. The tumors may be very dense and hard, or, in consequence of various retrogressive changes, they may soften and finally fluctuate distinctly when manipulated. Save in the absence or great scarcity of muscle-fibres, the microscopical appearances presented by sections of the ovarian fibromata correspond almost perfectly to those observed in the case of uterine fibroids. The smaller tumors

[1] This and the following drawing, for which the writer is indebted to his friend Dr. H. A. Matzinger, illustrate the gross and minute appearances presented by a solid tumor, of homogeneous fibrous structure and weighing seven pounds, which was removed by Dr. M. D. Mann in 1886. (See *Amer. Journ. of Obstet.*, vol. xx. p. 451.)

are made up of dense fascienli of fibrous tissue, running in all directions ; so that a cut surface presents fibres and cells divided in a longitudinal, oblique, and transverse direction. Transparent gray or yellowish areas then alternate with others of a whitish and more opaque appearance, the whole forming a medley which is familiar to the pathologist. In the larger growths some smooth muscular fibres may be found, and to such the name " myo-fibromata " would be applicable.

FIG. 345.
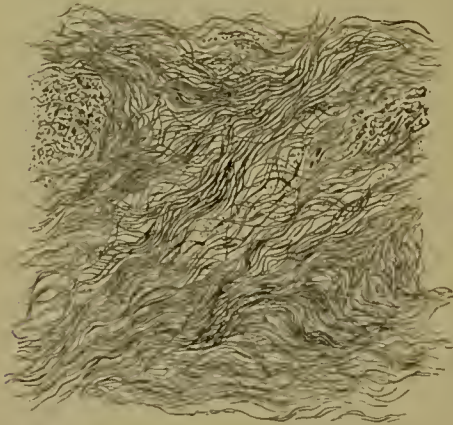
A Section of an Ovarian Fibroma.

Cysts of various sizes may also be present, produced by the softening and liquefaction of the tissues, and in other ways which we shall presently describe (cysto-fibromata of fibro-cysts).

Of the *etiology* of these growths very little is known. Some of the smaller tumors, however, are undoubtedly the result of inflammation, representing simply stroma of the organ in a condition of excessive hyperplasia, either localized or diffuse.

As for their *histogenesis*, it has repeatedly been shown that fibromata, either peduncular or sessile, may arise from the tunica albuginea. A few cases are also on record in each of which the tumor originated in a corpus luteum ; two such have been reported by Rokitansky, one by Klob, and one by Jenks.[1] The results of Patenko's studies are interesting in this connection.[2]

This observer declares that the enormous ovarian fibroids which have been described by various writers must have arisen elsewhere than in the ovaries, and certainly not in the *corpora lutea*, since the absence of vessels in true ovarian fibromata precludes their attaining any great size. The walls of the corpora lutea and other immature follicles, whether ruptured or not, become infiltrated with cells and converted into granulation tissue, and from this is formed dense new inflammatory tissue which contains no blood-vessels. Such corpora fibrosa may be either solid or hollow, according to the previous condition of the follicles from which they have developed. Surrounding the corpora fibrosa, however, are blood-vessels which undergo the same changes as the follicles. These degenerated vessels may be single or in groups, and in the latter case they form masses of sclerotic tissue which may unite with the sclerosed follicles and form true fibrous

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[1] *Amer. Journ. of Obstet.*, vol. vi. p. 107.

[2] *Vide* Patenko, "Ueber die Entwicklung der Corpora fibrosa in Ovarien," *Virch. Archiv*, Bd. 84.

tumors, the size of which varies according to the extent of the disease. But, inasmuch as the corpora fibrosa undergo no active growth, the resulting tumor can in no instance become larger than when all its follicles and blood-vessels are thus metamorphosed and aggregated into one mass—that is, not larger than a goose-egg. There is no doubt, however, that fibromata do develop from the ovarian stroma quite independent of any preceding inflammation.

Various *secondary changes* may occur in these tumors, such as the formation of cysts, mucoid, fatty, and calcareous degeneration,[1] torsion of the pedicle, interstitial hemorrhage, suppuration and gangrene, the formation of cartilage or bone, adhesions to surrounding structures, conversion into spindle-celled sarcoma, etc. Of these the most important is the formation of cysts of various sizes, the smallest of which are to be detected only with the aid of the microscope. A solid tumor in which these cavities form is called a "cysto-fibroma" or "fibrocyst," though, on the principle that *a potiori fit denominatio*, the latter term would be more fittingly applied to those tumors in which the cysts formed the more prominent feature. Such cysts may be due to localized degenerative softening and liquefaction of the tumor when their contents consist of fatty débris in a more or less fluid condition. Again, the cavities represent dropsical follicles of De Graaf, and contain fluid which is either limpid, cloudy, or tinged with blood. Finally, from some unknown cause the lymph-spaces in the connective tissue of the tumor may become distended with a clear serous fluid, which coagulates on being exposed to the air. The resulting cysts have walls of fibrous tissue representing ovarian stroma, condensed by the intra-cystic pressure. In the early stages of their formation such cystic lymph-channels probably constitute the so-called "gelatinous patches" or "geodes" described by various writers. Such lymphatic cysts may be so numerous and so large as almost to occasion fluctuation in the tumor (*fibroma lymphangiectodes*), while the resulting fibro-cysts attain enormous dimensions. A cancerous condition of an ovarian fibroma is also produced at times by the enormous dilatation of its blood-vessels, which takes place in consequence of torsion of pedicle and other causes.

Torsion of the pedicle is not rare, since most of the ovarian fibromata are small, firm, and provided with long pedicles—conditions which favor its occurrence. As in the cystomata, this condition leads to hemorrhage, inflammation, suppuration, and even gangrene. Cases of suppuration due to torsion, or to direct injuries inflicted upon the tumor during parturition, etc., have been observed by Rokitansky, Kiwisch, Safford, Lee, and others.

Cartilage or bone may form as pathological metaplasias of the

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[1] *Vide* article by Spencer Wells: *Trans. Lond. Path. Soc.*, vol. x. p. 199.

fibrous tissue. Thus Waldeyer describes an ovarian fibroid which had been completely converted into an osteoid structure;[1] and Kleinwäch-ter performed a laparotomy for the removal of a bony tumor a small portion of which was still fibrous.[2] Cartilaginous growths in an ova-rian fibroid have been reported by Schroeder. Inflammatory adhesions may form between the fibroma and the adjacent serous surfaces, both visceral and parietal, but they are rare in tumors of small size.

Ascites is a frequent and early complication of the ovarian fibroma, the fluid at times being very abundant. Little is known, however, of the causes to which this condition is to be ascribed.

Cancer of the Ovary.

The varieties of cancer which attack the ovary are the encephaloid or medullary, the scirrhous, and the alveolar or colloid; though the first of these is by far the most frequent in its occurrence. Either one or both ovaries may be involved, statistics showing the disease to be bilateral in about 50 per cent. of the cases (Leopold). As to the order of its appearance, ovarian carcinoma is much more frequently primary than secondary.

A word concerning the proper application of these final terms. When cancer appears in some organ, as the uterus, and subsequently in the ovary, the ovarian disease is said to be secondary; while, should the reverse order of sequence obtain, we speak of the cancer as being primary in the ovary. In neither case, however, does the proper use of these epithets imply a previously normal condition of the ovary; in fact, primary cancer affects an ovary already diseased much more frequently than it does the healthy organ.

Thus, a proliferating cystoma of the ovary not infrequently under-goes carcinomatous degeneration. In such a case the malignant disease makes its appearance in the cyst-wall as nodules or as more diffused swellings which in the beginning may be entirely overlooked. Later the encephaloid or medullary growth may invade the interior of the cyst, completely filling it in some cases. Such a tumor would be termed a *cystoma carcinomatosum*. Should the cystic element be less pro-nounced, the carcinoma appearing more as a luxuriant atypical growth of the glandular structures, the name *glandular* or *adenoid* cancer would be appropriate. That the proliferation of the epithelial elements of the ovary which results in the formation of the usually benign cys-tomata is not widely separated from malignancy is also evidenced by the fact that after the ablation of seemingly pure cystomata patients may soon die of cancer of the cicatrix, peritoneum, or of other organs.

[1] *Vide* Waldeyer: *Arch. f. Gyn.*, Bd. ii. S. 440.
[2] Kleinwächter: *Arch. f. Gyn.*, Bd. iv. S. 171.

Such clinical experiences have fallen to the lot of Klebs, Tait, Mann, and most other operators of prominence.

The malignant tendencies of the ovarian papillomata, whether superficial or intra-cystic, are now well known, as we have seen. These growths, which at first offer no anatomical evidence of malignancy, often assume a cancerous structure, spread over the surface, and invade the substance of surrounding organs, producing ascites and early death. This constitutes the so-called *papillary* cancer. Dermoid cysts may likewise undergo cancerous degeneration. Of 102 ovarian tumors removed by Schroeder, one dermoid, two papillary, and four glandular cystomata were found to be affected with carcinoma.

Colloid cancer, according to Waldeyer, is allied both to the cystoma and carcinoma, representing an intermediate or transitional stage. The ovary may be only slightly enlarged or it may exceed a man's head in its dimensions. On section it is found to contain numerous small cavities filled with colloid material in which epithelial cells may be found. Nests of epithelial cells are found in the stroma; and the whole growth resembles a parvilocular cystoma, with which, doubtless, it has frequently been confounded. It is probable that the alveolar cancer simply represents a medullary carcinoma or a scirrhus which has undergone mucoid or colloid change. This view is certainly supported by the observations of Rokitansky, who found that medullary cancer of the ovaries was usually associated with the colloid form.

An idea of the frequency of ovarian cancer may be gathered from the following: Peaslee observed the disease in its primary form but four times in over 200 autopsies and ovariotomies, and two of these cases might be regarded as uncertain; Olshausen found five cancers among 293 ovarian tumors which he had removed; Billroth observed the same number in the course of 86 ovariotomies; while Hildebrandt's record was seven cancers among 37 tumors. When malignant disease of other viscera is present it is not unusual to find the ovaries involved secondarily.

As for its *anatomy*, a cancerous ovary may be but slightly enlarged or it may reach the size of an adult's head. Its surface is generally nodular and of a whitish color; while the growth ranges from a somewhat firm to a soft brain-like consistence. In its general outline the tumor at first preserves the oval shape of the normal gland, though its later tendency is to assume a round form. The invasion of the ovary by the proliferating cancerous epithelium of the follicles, and the accompanying small-celled infiltration, may occur in two ways. In the first place, it may be diffuse, involving the stroma of the whole organ, or, again, and less frequently, one or more cancerous foci form in an otherwise healthy gland and increase in size, giving a nodular appearance to the tumor. That the disease is progressive, however, and

does not destroy all the follicles simultaneously, is shown by the fact that ovulation and conception have ensued in patients with bilateral ovarian cancer.

Because of the smaller size of the ovarian fibromata and the fact that they are usually attended with ascites, adhesions are not so frequent as in the case of the proliferating cystomata; with the progress

FIG. 346
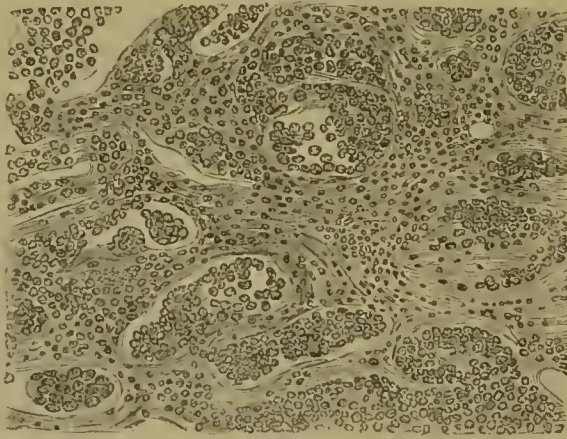
Encephaloid of the Ovary (Tait).

of the disease, however, they are prone to inflame and undergo other secondary changes which alter their general appearance. Membranous deposits then form on the surface of the tumor; it becomes adherent to the surrounding parts; the disease extends to the uterus, opposite ovary, intestines, and deep pelvic structures, till, finally, in the advanced stages of the disease the whole pelvis is filled with an irregular cancerous mass. Early in the disease the mesovarium forms the pedicle and the tumor is freely movable; soon, however, its attachment becomes broad and short or very thick. Finally, the pedicle may be entirely wanting.

Inasmuch as ovarian cancers correspond to those in other localities, so far as their minute anatomy is concerned, the subject requires no further consideration at present.

The fact that primary cancer of the ovaries is comparatively frequent between the ages of fifteen and thirty has an important bearing upon the *etiology* of the disease, suggesting as it does the potency of puberty in its early and most active period as a predisposing cause. Pregnancy and parturition, even when frequent, are seemingly without any adverse influence; and, though Olshausen, basing the view upon one of his own cases, suggests sexual excess as an etiological factor, this has not yet been proved. According to Tait, the occurrence of ovarian cancer may be traced to the death or absence of the ovules.

When this takes place the follicular epithelium reverts to the fœtal type of growth, its luxuriant proliferation resulting in the production of cancer-cells instead of the normal cylindrical variety. Should cancer occur primarily in other organs, its secondary appearance in the ovary could, of course, be easily explained.

Of *secondary changes* in ovarian cancers, the most important is fatty degeneration, which is usually most marked in the encephaloid variety. This results in the softening and disintegration of portions of the neoplasm, and ultimately in the formation of cysts, the cavities being bounded by ragged walls of carcinomatous tissue. Thus a cysto-carcinoma is produced, which differs, as we have seen, from a carcinomatous cystoma, since in the former case a cancer is complicated with cystic degeneration, in the latter this order is reversed. Mucoid and colloid degeneration, hemorrhage, and pigmentation may also occur in these tumors. Cases of psammomatous ovarian carcinoma have been reported by Flaischlen and Olshausen in which *corpora arenacea* were present in large numbers. These concretions, which formed in the epithelial cells, consisted of an organic base arranged in concentric layers, about which was deposited the carbonate of lime.

Metastatic malignant growths may make their appearance at almost any point of the body in cases of primary cancerous degeneration of the ovary; though the secondary deposits most frequently occur in the peritoneum, retro-peritoneal lymphatics, stomach, intestines, and liver.

Sarcoma of the Ovary.

This form of tumor finds its physiological prototype in the connective tissue, but in its immature or embryonic state, before final differentiation ensues, rather than in any of the forms which it assumes when fully developed. Thus, a collection of round cells which are precisely similar to those found in the embryonic mesoblast may retain its primitive character, the cells proliferating, but remaining round or oval in shape (round-celled sarcoma); later, all or only a portion of the cells may go a step farther in the scale of development and become transformed into spindles (spindle- or mixed-celled sarcoma respectively); some of the spindles may fibrillate and attain their full physiological development (fibro-sarcoma); finally, instead of fibrous tissue, others of the connective group, such as mucous or cartilaginous, may develop from a portion of the cells (myxo- or chondro-sarcoma). On the other hand, a typical histoid tumor, such as a fibroma, may secondarily become a sarcoma or fibro-sarcoma respectively, provided the cells throughout the growth or in a part only proliferate without any further development of formed tissue.

Sarcoma of the ovary, though more frequent in its occurrence than

carcinoma, is still a comparatively rare tumor, Schroeder finding but 10 such among 600 ovarian growths; while Olshausen reports that 12 out of 293 of his cases were of this nature. The spindle-celled variety is most common; and when one considers that the ovarian stroma is largely composed of young fusiform connective-tissue cells, Leopold's belief that the structure of the ovarian stroma favors the growth of sarcomata seems very plausible. The same view is also held by Klebs, who attributes the formation of these tumors to the hyperplastic growth of the ovarian stroma.

The pure round-celled or medullary variety of sarcoma also attacks this gland, though very rarely. Such a condition has, however, been reported by Beigel and Albert. Besides this and the spindle-celled sarcoma are found mixed-celled growths composed of both forms in varying proportions. Myxomatous tissue is quite frequently found in combination with sarcoma, the resulting growth being a myxo-sarcoma. These malignant ovarian growths are much more frequently bilateral than the proliferating cystomata, and when so they are generally of moderate size. In the majority of instances, however, the solid tumors range from a child's fist to a man's head in bulk; though cysto-sarcomata may even exceed in their dimensions the uterus at term. A case of the latter character is reported by Olshausen. After the death of the patient this author found a tumor weighing twenty-five pounds, notwithstanding the fact that twenty-two pounds of fluid had been drawn from its cystic cavities only shortly before the fatal termination of the case. Clemens[1] describes as a medullary sarcoma an immense tumor weighing eighty pounds, the sarcomatous nature of which, however, is doubtful. The growth had been present ten years, and had increased rapidly in size at the close.

Very little is known concerning the *etiology* of these tumors, though they seem to prevail most extensively when the formative and functional activities of the gland are greatest. Even the newly-born may be afflicted with sarcomata of considerable size (Klebs), while a large majority of the tumors occur during childhood and the period of greatest sexual activity.

The *gross appearance* of the ovarian sarcomata, particularly the fibro-sarcoma, resembles in many respects that presented by the fibroma and other solid tumors of the ovary. They are not so irregular in their shape as are the proliferating cystomata, being usually of oval or roundish contour; their surface is smooth, as a rule, and of a whitish or pinkish-white color, while in consistence they are generally, though not always, quite firm, the round-celled variety being soft and brain-like. Cysts of small size and projecting but slightly above the surface of the tumor are frequently present. On section the fibro-sarcoma usually

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[1] *Deutsche Klinik,* 1873, No. 3.

presents a translucent and somewhat fibrillated appearance, while the more immature forms resemble raw flesh to a greater or less extent.

The *microscopical characteristics* of these tumors are too well known to demand consideration here. The accompanying cut (Fig. 347) rep-

FIG. 347.
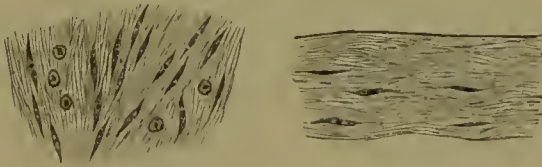
Spindle-celled Sarcoma of the Ovary (Doran).

resents the deeper, more cellular portion of a small spindle-celled sarcoma, as well as its more fibrous superficial structure. The large and numerous blood-vessels, of irregular distribution, usually form a prominent feature, and may lend a cavernous appearance to the tumor. Their walls are frequently formed by the cells of the neoplasm themselves— a fact which accounts for the early and rapid dissemination of this class of growths.

Occasionally that rare form of round-celled sarcoma first described by Billroth and known as the alveolar sarcoma is observed in the ovary. This tumor is easily confounded with the cancers because of its large epithelioid cells arranged in loculi. The fact that fibrils of connective tissue pass from the alveolar walls between the individual cells, however, serves to distinguish the sarcomatous nature of the growth.

When the epithelial as well as the connective-tissue cells of the ovary proliferate, the malignant mixed tumor is formed which Virchow terms sarcoma carcinomatosum. Spiegelberg[1] has also described a myxosarcoma carcinomatodes hæmorrhagicum in which sarcomatous degeneration of a mucous matrix coupled with hemorrhage had occurred. The presence of alveoli containing large fatty cells and possessing vascular walls of connective tissue supplied the carci-

FIG. 348.

Alveolar Sarcoma of the Ovary (Doran).

nomatous element. In case the glandular structures in a sarcomatous ovary develop and become prominent, an adeno-sarcoma results.

Among the *secondary changes* which take place in the sarcomata the most important is fatty degeneration, resulting as it does in the formation of softening-cysts without proper walls and containing fatty contents of a cloudy appearance. The blood-vessels in the vicinity of

[1] *Monatssch. f. Geb.*, Bd. xxx. S. 380.

these fatty foci may become thrombosed—an accident resulting, perhaps, in embolism, hemorrhagic infarctions, necrobiosis, and even rupture followed by peritonitis. Calcification may also take place; and, as we have seen, portions of the tumor may come to resemble various types of fully-developed connective tissue.

Inasmuch as the pedicle admits of torsion in some cases, the supervention of this accident may account for the occurrence of fatty degeneration, hemorrhage, inflammation, gangrene, and other changes of a retrogressive character. The small size of the tumors and the early appearance of ascites account for the comparative rarity of adhesions.

OTHER FORMS OF OVARIAN TUMORS.

1. LEIO-MYOMA.—Tumors composed of pure, smooth muscular tissue are extremely rare; indeed, Virchow asserts that such an ovarian neoplasm has been observed by Sangalli alone. The latter discovered a soft vascular growth of the ovary as large as a small hen's egg and composed principally of muscle-fibres, between which there appeared roundish cells.[1] "As the ovarian stroma contains no muscular fibres," says Fritsch,[2] "myomata could not possibly be observed;" but, as we have seen, this extreme statement is certainly and amply refuted by the investigations of many leading histologists of the present day. It is almost certain that the so-called ovarian myomata of the different authors were in reality fibromata, either pure or containing muscle-fibres in sufficient numbers to justify the name myo-fibromata. Thus, for example, the myoma of the ovary which is figured and described by Doran[3] should rather have been interpreted as a fibroma, since, in describing its minute structure as bearing "the very closest resemblance to sections from uterine 'fibroids,'" that author convicts himself of error, in the writer's opinion.

2. CHONDROMA.—The rarity of this form of ovarian tumor is instanced by the fact that but three cases are described as such in modern literature. In one of the two which came under the observation of Kiwisch[4] both ovaries were surrounded by a large number of thick cartilaginous plates and nodular masses, both large and small, in consequence of which the organs were enlarged to the size of hens' eggs and presented a tuberous appearance. In Kiwisch's second case the whole right ovary formed a tumor as large as a fist and was covered with false membranes. Numerous firm cartilaginous nodules appeared externally, which when incised were found to soften as the centre was neared, the tissue there presenting the character of hyaline cartilage of diminishing density. Of these tumors the first cannot be regarded

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[1] Sangalli (*Storia dei tumori*, ii. p. 220), quoted by Virchow, *op. cit.*, S. 223.
[2] *Op. cit.*   [3] *Op. cit.*, p. 97.   [4] *Diseases of the Ovaries*, 1860.

as enchondromata, since Virchow and others speak of them as simple cartilaginous thickenings of the tunicæ albugineæ. Scanzoni, who afterward saw the tumor removed from Kiwisch's second case, regarded it as a fibroma in the connective tissue of which new cartilage had formed. Finally, in January, 1882, Schroeder removed a solid tumor of the left ovary from a young woman nineteen years of age who soon after died from the effects of secondary cancer. The growth was about nine inches long, five inches broad, and nearly four inches thick, retained to some extent the contour of the normal ovary, as is generally the case with solid tumors of the ovary, and weighed about four pounds. Upon examination it proved to be a fibroma which had undergone myxomatous and chondromatous metamorphoses. Reiss,[1] who subsequently submitted the tumor to a most thorough examination, declares that it forms the second known case of true ovarian chondroma. Although the fibrous tissue still exceeded the cartilaginous in amount, Reiss feels that his conclusion is justifiable because of the comparative importance of the latter constituent (*a potiori fit denominatio*).

[1] "Ueber Enchondroma Ovarii," *Inaug. Dissert.*, Berlin, 1882.

THE CLINICAL HISTORY AND DIAGNOSIS OF PELVIC TUMORS OTHER THAN UTERINE AND TUBAL.

By MATTHEW D. MANN, A. M., M. D.,

BUFFALO.

OVARIAN CYSTOMATA.

CLINICAL HISTORY.—*Rate of Growth and Duration.*—We may conveniently divide the history of an ovarian cyst into three stages. In the first stage the tumor is confined to the cavity of the true pelvis; in the second, by a gradual growth, it reaches above the pelvis and as far as the umbilicus; while the third stage is reached when it passes the level of the navel and rises up into the epigastric region. The length of time consumed in each stage varies greatly in different cases.

As these tumors are very seldom recognized during the first stage, we have few data on which to base a computation of their rate of growth. Peaslee thought from a few cases observed by him that the average length of time between the inception of a growth and the discovery of its presence by the patient varied from two to two and a half years. The powers of observation, however, differ so widely in different individuals that the time of discovery varies greatly. The writer has seen a patient entirely unconscious of a fifteen-pound tumor before her attention was called to it by the attending physician.

The rate of growth generally increases almost in arithmetical ratio, so that small tumors grow slowly. If, then, we place the first stage as lasting from a year to a year and a half, we will be giving a liberal estimate.

In the second stage the tumor quite usually attracts the patient's attention—not as a rule, however, before it is several inches above the pubes. While the average length of the second and third stages can be found, there are many variations from this average. In some instances the tumors grow rapidly for a while, and then cease, or decrease their rate of growth so as to appear to stand still. In other cases, after a slow growth for some time, a sudden rapid increase will

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take place and bring the patient to the end of the third stage in a surprisingly short time.

Attempts have been made to determine the duration of the disease, when left to itself, from the first discovery of the tumor, generally during the early part of the second stage, to the end. The statistics of T. S. Lee comprise 131 cases from discovery till death, while Bird collected 50 cases. Of these, nearly two-thirds died within the first three years, and but a very few lasted beyond the tenth year. Lee states that the usual duration of the disease from discovery is one or two years. By tapping and other palliative treatment life is sometimes greatly prolonged, and even without this the patient sometimes lasts for years. Lee saw 2 cases of twenty-five years' duration, and 1 of thirty years'; Druitt had 1 of thirty years'; Frank, 1 of seventy-five years'; and Harris, 1 of fifty years'. Of some of them the diagnosis might be questioned, as the distinction between ovarian and parovarian cysts is of comparatively recent date, and, as is well known, the parovarian cysts usually grow very slowly and last longer than the ovarian. But Thomas has removed an ovarian cyst which had lasted twenty-three years, another twelve and a half years, another ten, and another nine years. I have seen one case of twenty-five years' duration which presented all the evidences of ovarian cyst, and have removed one which had lasted fifteen years, and three which had lasted eight years each, without tapping.

While many tumors grow thus slowly, others increase with remarkable rapidity. The writer has seen double ovarian cysts, with colloid contents, which weighed together twenty pounds, make more than one half of their growth in two weeks. Undoubtedly, in many of the recorded cases of rapid growth the increase is due to hemorrhage into the sac, but then the fluid will be largely mixed with blood. Among the older writers some of the cases can be explained as cases of hydramnios or pelvic inflammation and effusion; but others in recent times have noted still more rapid growths. Olshausen records a case of a cyst with colloid contents which increased in circumference from 92 to 100 cm. in ten days, with marked increase of the general symptoms. Tait reports a case where he removed a tumor of "great size" which had grown in four months. Still, although we may find exceptional cases of very slow and very rapid growth, we may safely say with Olshausen that in cases of proliferating cysts 60 to 70 per cent. die within three years from the first symptoms, and 10 per cent. more in the second year. Great harm may result from considering the slow-growing cysts as a proper basis for prognosis, and acting thereon. Rather should we 'consider them as exceptions, and look on the cases of early death as the rule. Unquestionably, tumors approaching the monocystic type grow more slowly than the polycysts.

Age.—No age is exempt from the invasion of an ovarian cyst. They have been noted as congenital.[1] Busch (Bonn) operated on a two-year-old child. Dr. J. F. Jenkins referred to a case where peritonitis followed the bursting of a cyst at three years and four months, while Thomas saw one at three years and five months, and Schwartz did a successful ovariotomy on a child four years of age. Other cases[2] have been reported as occurring at almost any year of life up to extreme old age.

The youngest with which I have met was sixteen, and the oldest seventy-seven years of age, the tumor having been observed for only eighteen months: both were cured by operation. Schroeder[3] operated successfully on patients aged seventy-nine and eighty respectively, and Homans[4] was successful on a patient eighty-two years and four months old, the tumor having been noticed for about two years. A number of other cases seventy years old and upward have been observed.

SYMPTOMS.—In the majority of instances ovarian cysts produce no pain. Even when very large there is nothing more than the weight and general discomfort due to size. But, exceptionally, there is more or less pain. This may be referred to the back, sides, hips, and pelvis, or directly to some spot in front over the tumor. This pain often comes in severe acute attacks localized over a small extent of the tumor. Such attacks may be intermittent, lasting from a day to several weeks. The cause of these attacks of pain I have been unable to determine. I have several times looked carefully after opening the abdomen at the painful spot, but have been unable to find any lesion either inflammatory or congestive. This is important from a prognostic point of view, as such attacks do not mean adhesions.

In some instances pain has been complained of in the bladder and rectum. Some patients will be unable to lie on one side, though perfectly comfortable when on the other. When the abdominal walls are tense and the tumor increasing, a bursting feeling is complained of. Sometimes, even when the tumor is quite small, gastric symptoms—indigestion, irritable stomach, even nausea and vomiting, with dry, glazed, red tongue—show themselves, and, joined with them, bloating and variable size; these symptoms are probably reflex and not due to pressure. As the tumor grows the symptoms become more marked, and we have added the direct results of crowding and pressure. The bowels, especially the large intestines, are interfered with; constipation is common, and occasionally complete obstruction is met with. The bladder is also pressed upon, and there is frequent desire to urinate;

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[1] T. G. Thomas: *Amer. Journ. Obst.*, vol. xiii. p. 118.
[2] Chenoweth: *Amer. Journ. Obst.*, vol. xv. p. 625.
[3] *Krankh. der Weib. Geschl.*, 1887, p. 420.
[4] *Boston Med. and Surg. Journ.*, May 3, 1888.

rarely retention is observed. The bladder symptoms seem to come less often from direct pressure than from an abnormal state of the urine induced by the disturbance of the digestive processes. As proof of this bladder symptoms are not the rule, and are sometimes absent with both large and small tumors. With large tumors the absence of symptoms can be explained by the rising of the tumor from the pelvis, so that there is room for the bladder under it. The secretion of urine is sometimes hindered, and the kidneys may be nearly flattened by direct pressure; their situation, however, usually protects them.

As a result of pressure the lower extremities may become œdematous. Emaciation is very common, especially in the third stage, and is much more marked in the upper half of the body. As a result of this, and perhaps aided by the mental anxiety induced by the presence of the tumor, the face assumes a peculiar drawn, anxious expression which is quite characteristic of the disease. It is called *facies ovariana*, and is thus described by Sir Spencer Wells : "The emaciation, the prominent or almost uncovered muscles and bones, the expression of anxiety and suffering, the furrowed forehead, the sunken eyes, the open, sharply-defined nostrils, the long compressed lips, the depressed angles of the mouth, and the deep wrinkles curving around these angles, form together a face which is strikingly characteristic."

The uterus is generally displaced and its functions are more or less interfered with. That the latter is not always the case is proved by the coexistence of pregnancy, many instances of which have been observed. The uterus is commonly pushed downward and backward, but often it lies in front of the tumor, and may even be drawn up to such an extent as to be easily felt between the abdomen and the cyst, and be more or less completely out of reach through the vagina. Menstruation generally goes on, but its regularity is often interfered with, and both the amount and frequency may be increased or diminished.

In women who have passed the menopause there is sometimes a bloody discharge from the uterus, irregular or nearly continuous, which may give rise to the suspicion of malignant disease of that organ. The condition of the uterus should always be carefully investigated before an operation, as it may at that time be possible to permanently rectify a displacement by an appropriate procedure, or by removing the other ovary to cause a shrinkage of a heavy, enlarged, and metrorrhagic uterus, which, if not cured, may after the ovariotomy still leave the patient more or less of an invalid.

The temperature during the early stages of the disease is seldom affected. When the tumor begins to fully distend the abdomen we sometimes meet with a little rise, in the evening 100°, while the morning register is normal or even subnormal. This is not due to any inflammatory action ; later the temperature-changes are more marked,

and as the end approaches it is not unusual to find a considerable rise—101° or 102°. Chilly sensations, not amounting to a real chill, are then not uncommon. As the tumor enlarges pressure on surrounding organs becomes more and more injurious and painful. The lungs act at a great disadvantage; dyspnœa and orthopnœa become marked. The patient is unable to sleep; the digestive organs refuse to work; the stomach rejects all food; emaciation becomes extreme; the lower extremities are greatly swollen; the temperature rises; the heart becomes more feeble and the pulse more rapid; and, finally, the patient sinks and dies from exhaustion. It will thus be seen that until near the end there is no clearly-marked clinical picture which is characteristic of ovarian cystic disease. While certain symptoms are often met with, there are so many exceptions that little expectation can be had of the occurrence of a particular one in any given case.

TERMINATION.—As we have already seen, what might be called the normal termination of an ovarian cyst is death from exhaustion through interference with the digestive and respiratory organs. Death may come in other ways—from certain accidents to the cyst itself, and also from complications depending more or less on the presence of the tumor. Before considering these accidents and complications the question of spontaneous cure presents itself for consideration.

The *spontaneous cure* of an ovarian cyst, to one who has seen and handled a tumor after its removal, may seem an impossibility, and yet many cases have been reported. That the cyst-wall should under any circumstances be absorbed seems hardly possible, but if it be emptied of its contents and secretion be stopped the mere presence of the empty, shrunken sac in the abdominal cavity can do no harm and does not count against a cure. The methods by which it is asserted that a cure may take place are—absorption, rupture, inflammation and perforation, ossification, and torsion of the pedicle.

Absorption.—That ovarian cyst can be spontaneously absorbed is certainly very doubtful. The difficulty of accepting any statement of this kind arises from the doubt as to the diagnosis. Given a tumor which bears all the clinical marks of an ovarian cyst, if that cyst disappears spontaneously without rupture, can we believe that it was an ovarian cyst? Most persons would certainly be incredulous.

Ossification of a cyst may occur. Winckel reports a specimen as existing in a Dresden museum. The tumor, as large as a man's head, is completely ossified and contains all the elements of true bone. Such a result is, however, unique, and perhaps could hardly be called a cure. As the other methods of cure all result from certain accidents to the cyst, they will be considered under this heading.

Accidental Changes in Cystomata.[1]

RUPTURE OF THE CYST.—The symptoms of rupture depend on the nature of the tear and the character of the cyst and its contents. In a cyst with bland watery fluid the only symptom may be a subjective feeling of something giving away, followed by a rapid diminution in the size of the cyst. The kidneys and bowels may rapidly eliminate the fluid, and little or no inconvenience be felt. If the cyst does not refill, a cure results, but this is very rare. In some cases there is more or less shock, followed by a slight increase in the temperature and pulse-rate, which after lasting a few days entirely subsides. If the cyst-opening is small, it now generally closes and the sac refills; rupture may again follow, and the process be repeated a number of times. If the opening fails to close, the patient may suffer from a chronic ascites, secretion from the cyst-wall going constantly on, aided by the inflamed peritoneum. In this case a diagnosis is difficult and the disease is apt to be considered malignant. The result is generally exhaustion and death, though an operation may result in a cure.

If colloid material exist in the sac, its eruption into the peritoneal cavity has a very different effect. This colloid matter is generally very irritating, sometimes actually poisonous, as in a case met with by Dr. J. P. White. Then its presence sets up peritonitis, which may be violent and acute or subacute, passing into the chronic form. Such a result I have seen follow simply tapping with a hypodermic needle a very tense colloid cyst: an operation with careful washing out of the abdomen cured the patient, but only after a severe attack of acute non-suppurative peritonitis, which began before the abdomen was opened.

In one case in an exploratory operation I found a multilocular cyst firmly adherent to the pelvis. In one of the smaller cysts there was an opening the size of a lead-pencil, with round, smooth, sharply-cut edges. From this exuded a very small amount of an exceedingly thick colloid material. This was just enough to keep up a constant irritation and exudation from the peritoneum, so that the abdomen was filled with fluid. Owing to the extreme feebleness of the patient and the very firm adhesions, the operation was abandoned, after first sewing up the hole. The patient died of exhaustion a few months later, though the tumor was quite small.

When a cyst is ruptured by the presence of papillomatous growths from within the result is apt to be bad. The papilloma crowds into the opening, and when in contact with the peritoneum, as claimed by Doran, is capable of causing a malignant infection. The rupture into the abdomen of a gangrenous and suppurating cyst must necessarily be quickly fatal. Fortunately, these cysts do not always rupture in this

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[1] See chapter on Pathology, same title.

way. The opening may be into one of the hollow viscera, as stomach, intestines, or bladder. The rectum is a favorite seat of this accident. Of course adhesion must first occur. A cure might thus result, but death from septicæmia is more general.

I have once seen a suppurating cyst rupture through the abdominal walls through the scar of an old puncture. When seen it had been discharging in this way for a long time, the patient suffering all the time from sepsis. Cysts which are not suppurating may discharge in a similar manner; that is, through either the intestines, bladder, or abdominal wall. Instances are on record where such discharges have lasted for years; but, in general, if suppuration has not occurred, it is apt to follow the admission of air or gas from an intestine.

Hemorrhage from rupture is usually slight, as the thinned cyst-walls are apt to contain few vessels of any importance to bleed. But if the inside of the cyst be very vascular, the diminution of pressure within the cyst by relieving the support of the vessel-walls may result in their rupture and a more or less violent hemorrhage. This may be sufficient to very rapidly reduce the patient to a condition of extreme anæmia, and should always be borne in mind as a possibility after rupture of the sac.

Rupture into a Fallopian tube has been observed. This occurs in the so-called tubo-ovarian cysts. I have seen the tube as large as the small intestine. Should rupture occur into such a tube perfect drainage would be established. Air would hardly be admitted and suppuration be little likely to occur. Successive filling and discharge through a tube have been noted.

TORSION OF THE PEDICLE.—The symptoms produced by torsion of the pedicle vary with the rapidity and degree of the twisting. If the process goes on slowly, no symptoms may be produced. In a case recently operated on there were three complete turns, with obliteration of all the vessels of the pedicle, but there had never been a symptom to arouse any suspicion of such an accident. Again, if torsion comes on suddenly, the result may be gangrene of the cyst. This will be followed by the symptoms first of peritonitis, and later of septicæmia and collapse. Symptoms of collapse also may follow hemorrhage into the cyst, or there may be marked anæmia and loss of strength from the loss of blood. Peritonitis is a common result even when gangrene does not take place, and is shown by the usual symptoms of that disease. When the torsion goes no farther than to merely hinder the blood-stream, the growth of the tumor may be stopped or absorption take place. This is a very rare but fortunate event.

HEMORRHAGE INTO THE CYST.—As has already been stated, hemorrhage into an ovarian cyst may result from various causes. It is not uncommon to find evidences of more or less blood in the cyst

when it is opened. This may be only enough to color the fluid slightly, or we may find thick layers of fibrin of different ages, almost rendering the cyst solid. This, in my experience, occurs most commonly in a form of tumor rarely met with, which has very thick but soft walls, approaches the monocystic type, and grows slowly. Occasionally the hemorrhage may be so severe and sudden as to cause alarming symptoms of collapse. Parry[1] observed a case where this hemorrhage was so severe as to threaten a fatal termination. Thomas has also observed two similar cases. The cyst in Parry's case increased an inch or more in all directions in the course of a few hours. The cause of such a hemorrhage is not understood. Should it be as severe as in Parry's case, it might necessitate immediate operation to save life. In milder cases the only harm may be an increase in the general debility and anæmia.

SUPPURATION OF THE SAC.—Inflammation and suppuration of the interior of an ovarian cyst is one of the most unfortunate accidents to which it is liable. Unquestionably, one of the most common causes is the admission of air or foreign matter, and, therefore, germs, from the outer world. It is this which makes tapping and the withdrawal of a portion of the cyst-contents for diagnostic purposes so dangerous. There are also other ways in which foreign matter may be introduced. For instance, I have in my possession a specimen of a uterus in the fundus of which there are two holes. One hole was made by the uterine sound in my presence. There was also a suppurating ovarian cyst firmly adherent over its whole surface, the result of old peritonitis. There was a distinct history of the sound having been passed through the uterus on several previous occasions, as was proved by the other opening; and I have no doubt that after the peritonitis which followed the first puncture the sound entered the cyst, the walls of which were very thin. This sac was removed, but the patient died of the pre-existing septicæmia. I have several times seen suppuration follow tapping, particularly in the days before antiseptics.

The symptoms of suppuration of the cyst are those of septicæmia, which is an inevitable consequence of the presence of pus, moderately high temperature with very rapid pulse, gradual exhaustion, and death. The course of the disease may be run in a few weeks or may last for months. The cyst may rupture either through the abdominal wall, in the scar of an old puncture, as already mentioned, or into the intestines, bladder, or Fallopian tube. In either case the disease is not generally stopped, but, as there is imperfect drainage, the condition and symptoms remain the same, plus a constant discharge of pus.

The diagnosis is made by the presence of the symptoms, by testing

[1] *Am. Journ. Obst.*, Nov., 1871.

the character of the discharge if there be any, and also by the presence of gas within and a consequent tympanitic resonance over the tumor.

The treatment is to remove the sac if possible. Many such cases have been successfully operated upon. In considering the question of the spontaneous cure of ovarian cysts (p. 1054) the reader was referred to an account of the accidents which might end thus fortunately. A study of the causes and usual effects of these accidents must, however, prove that the cures happen very seldom, and are always the exception and not the rule, so that their occurrence should never be counted upon. Also it must be noted that the risks run by the patients are so great, even when a happy termination ensues, that we should never seek to imitate by art any of the plans sometimes followed by Nature, for the reason that far better and safer ones exist.

COMPLICATIONS.

Besides the accidents which have just been considered, certain complications may arise during the existence of an ovarian cyst which may render more difficult the diagnosis and materially interfere with the treatment. The first of these to be considered is

PREGNANCY.—It is a well-recognized fact that the presence of an ovarian tumor of any kind or size in one ovary by no means interferes with the functions of the other, and consequently conception may take place. Even advanced disease of both ovaries may not produce sterility, and a number of cases have been reported where pregnancy has existed together with double ovarian tumors. In some of these cases no ovarian tissue could be recognized, though of course a few follicles must have escaped the destructive processes.

The presence within the abdominal cavity of two or perhaps three growing bodies is likely to cause a rapid and even enormous distension. As a result dyspnœa and the other effects of abdominal distension are apt to appear early and to become very marked. In some cases pain of an agonizing character has been experienced.

The pressure of the growing uterus on the tumor has been known to cause rupture of the latter into the abdominal cavity, with a resulting peritonitis. Cures have also been noted as following rupture under these circumstances.

Torsion of the pedicle is a peculiarly liable accident, and hemorrhages into the tumor are more likely to occur than in the non-pregnant condition.

As a rare accident suppuration of the cyst has been noted, particularly in dermoid cysts. An additional and generally fatal accident is ileus.

Not only is the tumor affected by the enlarged uterus, but the influence is reciprocal. In a considerable number of cases abortion and premature labor result, and both these processes are attended with more than usual risk. Jetter collected 215 cases, in which there were 21 abortions and 15 premature labors. Labor at the time is attended with unusual danger. If the tumor is small, it may come down before the advancing head and be an obstacle to further progress. In this case either pushing it above the pelvic brim or tapping the tumor through the vagina (not through the rectum) should be tried. Where the tumor is above the pelvis the mechanism of labor is apt to be interfered with and the puerperal period is rendered more dangerous. Rupture of the uterus has occurred at this time.

Statistics show the mortality to be very great (Jetter), but in the experience of some this has not been found to be the case. I have met with but three cases, in each of which labor was uncomplicated. In one I removed the tumor (forty pounds) a few weeks later.

In regard to treatment there are but two questions which may come up for consideration. If the pregnancy is discovered early, shall it be allowed to proceed or shall the tumor be removed or tapped? The results of ovariotomy during pregnancy have now become so good that it hardly seems justifiable to kill the child in order to prevent possible risks. Unless there is some very positive counter-indication this operation is safer and offers better results than tapping, and should always be resorted to.

Occasionally, especially if very near the end of gestation, tapping may be indicated, but it is not to be forgotten that the dangers of tapping are nearly as great as those of a well-performed ovariotomy. As the tumors always grow with especial rapidity during pregnancy, tapping is likely to be repeatedly necessary.

Rupture into the peritoneal cavity should generally be the signal for immediate operation. The same is true if torsion of the pedicle and obstruction of the bowels occur.

ASCITES.—It is not very rare to find, together with an ovarian cyst, a certain amount of fluid free within the peritoneal cavity. This may arise, as in the case of ordinary ascites, from disease of the heart, liver, or kidney. Its presence then makes a complication which is serious just in proportion to the degree of the disorganization of the affected organ. In a recent case of a small ovarian tumor the writer found considerable œdema of the extremities, fluid in the abdomen, scanty and albuminous urine, dyspnœa, and rapid pulse. Under appropriate treatment the symptoms all subsided, the urine became free, the dropsy disappeared, and an operation was successfully performed. The patient has since remained well. Besides the ascites due to this cause we often meet with fluid around an ovarian tumor which is not dependent on

disease of any of the vital organs. This is particularly true of fibroids of the ovary and malignant disease.

Where there is an ordinary cyst the fluid is due to an irritation of the peritoneum, which may show itself simply as an increased vascularity of the parts or may in time pass to a true chronic inflammation. It will, as a matter of course, then be more apt to be found with tumors of long standing. In one recently operated upon of fifteen years' duration there were several quarts of free fluid. In another case, with a tumor weighing only about fifteen pounds, there were fifty pounds of free fluid. It was only from a previous knowledge of the case that a recognition of the tumor was possible. In this instance the whole peritoneum except that covering the viscera was fully half an inch thick and contained large plates of coagulated fibrin floating free. The presence of free fluid within the abdomen as an accompaniment of a tumor is of no particular clinical importance. It only shows that the tumor is not everywhere closely adherent, though it does not altogether exclude the presence of adhesions. It does not interfere with operation, but some have claimed that its presence in large quantities demands the use of a drainage-tube. In this I am inclined to agree, though confident that where there is only a moderate amount with a recent tumor no such necessity exists.

As a symptom of rupture of a cyst ascites is of more importance. In this case the tumor is likely to be felt as a small hard mass in the fluid, and may readily be mistaken for malignant disease. Only the history, and perhaps an exploratory incision, can complete the diagnosis. When only one small secondary cyst ruptures, the constant escape of the irritating contents may keep up the ascites and so increase the exhaustion.

PERITONITIS.—Acute peritonitis, we have already seen, may result from rupture of a cyst and from torsion of the pedicle. It also occurs independently of these conditions, sometimes without assignable cause. I have several times seen it occur, in one case three times in quick succession, a successful ovariotomy having been performed as the third attack was subsiding. If the cause can be diagnosed as being due to either of the above-named accidents, it should be promptly treated by operation. If idiopathic the subsidence of the acute symptoms may be awaited before an operation is undertaken. The occurrence of idiopathic peritonitis is doubted by some. As already mentioned when treating of ascites, chronic peritonitis sometimes exists. It is no bar to operation. Its diagnosis is impossible or extremely difficult. Even the presence of free fluid in the peritoneal cavity is no certain test, as inflammation may exist without it. The peritoneum becomes greatly thickened, and so altered in appearance as to have lost the semblance of a serous membrane.

OBSTRUCTION OF THE BOWELS, either partial or complete, is a rare complication of ovarian tumors. It is wonderful the way in which the intestines continue their functions notwithstanding the presence within the abdomen of a large tumor. A small tumor, still within the pelvis, by pressing directly on the rectum may cause much more trouble than a large tumor which has risen entirely above the pelvic brim. Still, occasionally we find, especially in those of constipated habit, large accumulations of hardened fecal masses within the intestine. Interference with the rectum may arise from adhesions resulting from pelvic peritonitis. Complete obstruction of the bowels may occur, and may be known by the usual signs. It can hardly result from simple pressure, but rather from bands of adhesion. It must be considered as an immediate indication for laparotomy, with removal of the cyst and constricting bands.

SEPTICÆMIA.—Simple septicæmia occurring in the course of an ovarian tumor may have for its cause either some change in the tumor itself, such as gangrene or suppuration of the cyst-walls, or may be due to some coincident disease not directly related to the tumor. I have met with it as the result of a collection of pus in the tube, and also from a pelvic abscess. In one instance such an abscess burst into the bladder and at the same time into the intestine, making a most serious complication. The diagnosis of the exact cause may be exceedingly difficult, and to eliminate disease in the tumor proper and malignant disease may require aspiration of the cyst to see if its contents be pus. It must be remembered that in some cases of simple cyst toward the end of the disease slight chills with an average rise of temperature of from one to three degrees is not uncommon. The existence of septicæmia must have an unfavorable prognosis on an operation whatever its cause. Still, the operation is all the more imperatively demanded.

GASTRITIS AND ENTERITIS are symptoms met with generally toward the close of life. They show themselves by a dry, glazed tongue, vomiting and diarrhœa. The prognosis is eminently unfavorable and the call for immediate operation imperative.

KIDNEY DISEASE.—The mechanical interference with the stomach and liver, and consequently with their circulation and functions, has a marked influence on the urinary secretion. It is not at all uncommon to find the urine very scanty, high colored, extremely acid, and containing quantities of uric acid and urates. Such a condition of the urine, should it last long, months or years, must in the end have a deleterious effect on the structure of the kidney. The whole urinary tract becomes irritated and interstitial nephritis may in the end supervene. Such a condition of the urine should be corrected, if possible, by the free use of alkalies and the best of all diuretics, water. If an

operation be undertaken with the urine in this condition, more or less trouble is likely to result, as has been pointed out by Sir Spencer Wells.

Interstitial nephritis is difficult to diagnose, as albumen and casts are not always present in the urine, and it has doubtless been the cause of many deaths after ovariotomy. Œdema of the lower extremities is not generally due to it. Emmet has pointed out the danger of giving ether in these cases, and when the integrity of the kidney is suspected it will certainly be safer to use chloroform.

The kidneys may also be diseased as a direct result of pressure. The kidney is so well protected that pressure on the organ itself can seldom occur, but the ureter when it passes over the brim of the pelvis is more liable to be pressed upon. As a result of this we have dilatation of the ureter and organic changes in the kidney itself. Doran thinks that the condition of the urine which Spencer Wells has found so dangerous, before alluded to, is due to congestion of kidneys not healthy, but damaged by pressure.

The prognosis in cases of kidney trouble with an ovarian tumor, if the patient survive the operation, is eminently good, as the exciting cause is removed with the tumor, and the kidney, if not too much damaged, will not suffer further injury, but continue its functions indefinitely. The ureter sometimes becomes intimately associated with the sac-wall. In a recent case I was obliged to dissect out some eight inches of the ureter from the wall of a sac deeply attached in the pelvis.

DISEASES OF THE LUNGS.—Phthisis rarely occurs in the course of an ovarian tumor. It has been an observation, in which I think other gynecologists will agree, that consumption very rarely occurs in patients suffering from uterine or ovarian diseases. There seems to be an antagonism between them. This extends to ovarian as well as uterine tumors. Should phthisis be discovered in its early stages and an ovarian tumor of any considerable size exist, the presence of the tumor cannot but exert an unfavorable influence on the lung disease, as it would interfere with proper respiration and expansion of the lungs.

An attack of bronchitis is always a more or less serious complication, as the act of coughing is difficult and painful. For manifest reasons no operation should be undertaken until the cough has been cured. The use of ether in cases recently recovered from bronchitis, and in old subjects, is apt to bring on the disease. To prevent the bad effect of ether under these circumstances, Mr. Tait has devised an apparatus for warming the vapor. I have found it well in such cases to substitute chloroform.

HEART DISEASE.—Organic valvular disease does not necessarily exert a very unfavorable influence on patients suffering from ovarian

tumors. All depends on the character and amount of the disease. Of course the principal question for decision is whether the affection of the heart will permit an operation. For the decision of the question no certain rules can be laid down. I have several times operated when there was a marked valvular murmur, but where the heart's functions did not seem to be materially interfered with, and without bad results.

There is an impression altogether too firmly fixed in the mind of the profession that all cardiac diseases preclude any operative interference demanding an anæsthetic. The idea is entirely wrong; no such general rule can be laid down; each case must be judged for itself.

In the *British Gyn. Journ.* for May, 1886, Dr. Bedford Fenwick calls attention to the frequency of fatty degeneration of the organs, particularly of the heart, in cases of long-standing abdominal tumors. He found in a number of cases rapidly fatal after ovariotomy that the right side of the heart was thinned and the whole cardiac muscle in a state of fatty degeneration. This he attributes directly to the presence of the tumor. The condition he believes is not a rare one, especially in patients of middle or advanced life, and must have a marked effect on the prognosis and results after ovariotomy.

The diagnosis of the condition is difficult, but can be made out by, first, a very feeble, rapid, and excitable pulse; second, a very dull and feeble heart sound, especially over the right apex; third, a very short systolic rise in the sphygmographic tracing; fourth, a very great tendency to syncope.

The danger of operating in such a case must be very great, and this condition undoubtedly has caused many deaths both on the operating-table and within a few days after the operation. It is certainly a strong argument for early interference.

UTERINE DISEASES.—The uterus is almost always displaced by an ovarian cyst. I have never been able to observe that the displacement in itself caused any symptoms. The menstrual function is variously affected. There may be total suppression, menorrhagia, or even metrorrhagia. The size of the uterus varies. It is sometimes apparently enlarged, and again seems to be atrophied. The uterine appendages on the opposite side may be normal in condition. The tube on the affected side, making up as it often does a part of the pedicle, is always changed. This change may result in a complete atrophy of the tube from its incorporation with the coverings of the tumor or a greater or less hypertrophy. In one case I found it enlarged nearly to the size of a man's wrist and closely resembling an intestine. The tubes on either or both sides may be the seat of inflammation, even suppuration, and consequently filled with pus. The opposite ovary is often the seat of early cystic disease, and rarely of an abscess.

The practical point to be deduced from these facts is that in every case where an operation is done the opposite ovary and tube should be carefully examined and removed if found to be diseased. Also, the uterus, if retroverted, may be sewed to the anterior abdominal wall, thus permanently overcoming the displacement.

HERNIA.—It might be supposed that the excessive increase of the intra-abdominal pressure would quite frequently cause an escape of the abdominal contents at the points of least resistance. As a fact, hernia is a rare complication of ovarian cystic disease. In one hundred recorded cases of my own I find inguinal hernia but once, and femoral, umbilical, and the other forms of hernia not at all. There is sometimes a distension or pouting of the navel from a coincident ascites, which somewhat resembles a hernia, and which may become the seat of a hernia after the operation unless attended to. This latter complication is not at all uncommon. The reason for the rarity of herniæ is that the avenues from which they usually escape are closed by the tumor, the abdominal contents being pressed away from rather than through the openings. Should a hernia exist, it has been recommended that it be cured at the time of the ovariotomy. The umbilicus can be cut entirely out, as there is usually sufficient redundant tissue.

PROGNOSIS.

The tendency of all ovarian tumors, whether cystic or solid, is toward a fatal termination. The length of time which they may last has already been discussed. The exceptional cases in which they last for many years are so few as to have little influence in guiding us when we undertake to give an opinion as to the future. We are quite safe in making a universal prognosis in the case of ovarian cysts, at least so far as to say that the end is only a question of time, be it longer or shorter. If art steps in to remove the disease, the outlook changes at once. The best ovariotomists now expect a mortality of about 6 per cent.—figures which some have improved upon, but which are likely to represent the general average of a number of our best operators.

DIAGNOSIS.

The diagnosis of a simple ovarian cyst to an experienced practitioner presents ordinarily few difficulties. Still, so many complications may arise that often the most experienced and practical ovariotomist will fail. The abdomen has been opened to find no tumor present, or to find it simply filled with fluid or occupied by a pregnant uterus, so that the utmost care should be taken to arrive at a correct conclusion.

Both the subjective and objective symptoms must be utilized. A careful history of the case from the patient's own lips, given without leading questions, is of importance. Generally, it will be quite simple and by no means conclusive. Further than this, the methods to be employed in making a diagnosis vary with the size of the tumor. Small tumors seldom attract attention, and are generally discovered by accident, as it were, in making a vaginal examination; while if the tumor is large enough to fill the abdomen, the patient is conscious of its presence and goes to the physician to ascertain its nature. If large, various methods of examination may be employed which are not applicable to tumors confined to the pelvis. It will be necessary, then, to consider the diagnosis of large and small tumors under separate headings.

Diagnosis of Small Ovarian Cysts.—As has been said, small ovarian tumors are seldom recognized by the patient, but occasionally by the production of pain or marked irregularities of menstruation—menorrhagia, for instance, and other signs of pelvic disturbance—they lead to a vaginal examination (for method see Vol. I.), and so are discovered. If quite small, they may lie to one side of or behind the uterus. They are usually smooth, movable, and painless, and generally the presence of fluid may be detected by the sense of touch.

Great aid may be had in the examination by the bimanual or conjoined method, one finger within the vagina and the other hand on the outside over the inlet of the pelvis. If the abdominal walls are not too fat and rigid, a great deal can be learned in this way. The principal things[1] with which such a cyst is likely to be confounded are a uterine fibroid, retroflexion of the uterus, extra-uterine pregnancy, and hydro- and pyosalpinx. The fibroid is to be distinguished by its density, and, in the great majority of instances, by the implication of the uterus in the growth, and by the fact that it is multiple. Retroflexion will offer no difficulty to the expert, whether it be of a pregnant or non-pregnant uterus. If pregnant, the symptoms alone should make the diagnosis. If non-pregnant, the passage of the uterine sound will remove all doubt. With extra-uterine pregnancy the difficulties are greater. The severe pains usually met with and the ordinary signs of pregnancy may be absent, but the shape and the feel of the tumor if Fallopian are entirely different. It is long rather than round, more dense, less smooth, and is also more fixed in the pelvis. An ovarian pregnancy the existence of which is doubted by many, but which does exist, as can be proved by a specimen in my possession, could not be distinguished.

Hydrosalpinx is always firmly fixed in the pelvis, and could not be

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[1] Dr. P. F. Mundé has recently reported a floating kidney mistaken for a small ovarian tumor. The case is unique: *N. Y. Med. Journ.*, July 21, 1888.

distinguished from an intra-ligamentary cyst except by its history. If double, as is often the case, the chances would be in favor of the tubal origin.

Pyosalpinx greatly resembles a small cyst to the touch, but is almost always double, and there is a history of repeated attacks of pelvic peritonitis. The cysts lie on the sides, and are usually sausage-shaped and not spherical.

Diagnosis of Large Cysts.—If the tumor has reached sufficient size to attract the patient's notice, there will be certain subjective symptoms to which she will call attention. Some time before she will have seen that her abdomen was increasing in size. She may say that the enlargement was at first on one side, but this is often overlooked. She will have had no pain, or if any it is slight and confined to a certain locality in her abdomen. There is perhaps some disturbance in her menstrual functions and the digestive organs are more or less disarranged. The bowels are constipated, and the kidney secretion is rather scanty. If the tumor has lasted some time, a gradual emaciation, particularly of the upper part of the body, has been noticed. The time elapsing since the tumor was first noticed is often very short, even for large growths. On looking carefully at the patient the peculiar facies may be recognized, which with the history will at least arouse strong suspicions as to the true nature of the patient's trouble. To confirm the diagnosis it is essential that a careful physical examination of the abdomen be made. To do this satisfactorily it is necessary to have all the conditions as favorable as possible. In the first place, the whole of the abdomen, not simply a portion of it, must be exposed to the view and touch. It is perfectly impossible to exercise the delicate sense of touch on which we depend so much, to say nothing of the sense of sight, if any fabric intervenes between the finger-tips and the skin of the patient. Next, the patient must assume the recumbent position, that the abdominal muscles may be all relaxed. A hard bed or lounge will do for this, but a table is much better, as it raises the tumor more prominently forward, and from its being higher the examination is much easier and consequently better.

Let us suppose, then, that the patient is laid upon her back upon a table with the abdomen bare and the clothing loosened, the first thing to do is to determine whether the enlargement is due to the presence of a tumor or to some other cause.

Conditions Simulating Tumors.

There are a number of conditions which closely simulate abdominal tumors, and which have been frequently mistaken for them. These must be excluded as the first step in the diagnosis. They are—abnormal

accumulations of fat in the abdominal walls; accumulations of gas and fluid in hollow viscera; muscular spasm; free fluid in the abdominal cavity; and pregnancy.

OBESITY.—In women in middle life, especially about the menopause, there is often a tendency to the excessive production of fat. The accumulation may be general, but is often much more marked about the abdomen than elsewhere. In women the fat is more apt to be in the abdominal walls than in the omentum, as in men. Occurring as they commonly do about the time of the menopause, and being accompanied by certain vague uterine symptoms, with more or less pain and inability to walk or stand, these cases are very deceptive unless the practitioner is on his guard. In one year no less than six such cases were presented to the writer for operation, on the supposition that they were ovarian tumors. To quote what I have written elsewhere:[1] "The diagnosis can be readily made by grasping the abdominal walls between the thumb and finger or between both hands, so as to appreciate its thickness, just as we would apply the same test to any other article. A layer of fat five or six inches thick spread over the abdominal walls is enough to account for the increased size without a tumor."

As additional aids to diagnosis it is to be remembered that large ovarian tumors generally induce great emaciation; that on percussing the abdomen when there is a tumor it will be uniformly flat except on the flanks; and that the tumor is firm to the touch. With fat there is much less sense of resistance, and always more or less resonance on percussion, especially if the hand used to percuss upon is pressed firmly and deeply into the abdominal walls. When very fat the abdomen hangs in folds as the patient sits up, and the umbilicus is retracted. The sense of fluctuation in a mass of fat may be misleading, but it is very different from the fluctuation of an encysted fluid. The true nature of the apparent fluctuation may be appreciated by percussing on some other fatty part of the patient's body, as the breast or thigh, when exactly the same pseudo-fluctuation will be perceived.

Large fatty accumulations within the abdomen are quite rare. They are more difficult to diagnose, but the absence of all other signs and symptoms of ovarian disease should be decisive.

ŒDEMA of the abdominal walls has been mistaken for an intra-abdominal tumor (Peaslee). The application of the simple test of pitting on pressure should make clear the real nature of the trouble.

TYMPANITES.—It seems scarcely possible that the distension of the stomach or bowels with gas should be mistaken for a tumor. But the mistake has been commonly made, and not only made but acted upon. Simpson quotes six cases in which on opening the abdomen only tympanites was found. The absence of a tumor on palpation, and the

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[1] *Medical Press Western New York*, Jan., 1888.

absence of fluctuation, with the tympanitic note on percussion, should certainly serve to distinguish the condition from a tumor, especially when taken with the history of the case.

DISTENDED BLADDER.—A distended bladder may bear a great resemblance to a cyst. Dr. Gooch (Peaslee) mentions a case in which a distended bladder in a pregnant woman was mistaken for an ovarian tumor, and a similar case occurred in my own practice. A woman who had been three days in labor was brought seventy-five miles on account of an abdominal tumor which was supposed to be ovarian and to be obstructing the labor. The passage of the catheter proved the tumor to be an enormously distended bladder. In Dr. Gooch's case a trocar was thrust into the uterus and into the head of the child. Other cases (see Peaslee) have been reported. In each there was a tense, non-sensitive cyst of some weeks' duration, greatly resembling an ovarian tumor. If the rule be followed to pass the catheter in every case of suddenly-developing tumor, all chance of making a mistake of this kind will be avoided.

FECAL OBSTRUCTION.—Besides being distended by gas, the intestines may be the seat of a great accumulation of feces. This forms in one hard mass or masses more or less separated. Several years ago I met with a case in which there were two large tumors in the abdomen and a third completely filling the pelvis, so that even a finger could not be introduced into the vagina. An examination *per anum* showed the latter to be hardened feces. Presumably the others were of the same kind, but the abdominal walls were fat and it was difficult to positively decide. A course of saline cathartics, however, removed the whole. In this case the patient was in perfect health, and suffered no inconvenience from the accumulation. Her physician had diagnosed double ovarian tumor.

The characteristic sign of a fecal tumor is that it will pit on pressure. If it can be reached through the rectum or vagina, this test is easily applied, but if not and the abdominal walls are thick or tense, a diagnosis may be difficult. A course of cathartics may serve to remove the mass and make the diagnosis clear.

The uterus, distended either by a growing fœtus or some fluid or gas, has frequently been mistaken for a tumor. It is essential that the possibility of pregnancy should be borne in mind when making a diagnosis in any case. This subject calls for careful consideration.

PREGNANCY (NORMAL).—In the earlier months the danger of a mistake of this kind is slight. It is only after the middle of the fifth month that the uterus rises so high as to be likely to be mistaken for a tumor. That the breast-signs, cessation of menstruation, and fœtal movements may all be wanting is known. We must depend, then, entirely on the results of a physical examination; and it is in these

cases that mistakes are liable to be made. The shape of the tumor is generally different, the pregnant uterus being, as a rule, broadest at its upper part rather than in the middle. The uterus stands out from the pelvis more prominently than a tumor of the same size (Greig Smith). The sense of fluctuation is by no means clear in the uterus, and the uterine walls have an entirely different feel. Braxton Hicks has pointed out a most important sign in this connection. He has noticed that if the hand be held for some time on a pregnant uterus there will be noticed an alternate relaxation and contraction of the walls. This he maintains is a constant phenomenon, and serves at all times to distinguish a pregnant uterus from a cyst, which under no circumstances can have such contractions. As Tait says: " The relaxation and contraction of the uterus in pregnancy is a method of diagnosis which, when once made apparent, can never be mistaken for anything else."

In addition to this, we have later the auscultatory signs, which are very reliable unless the foetus is dead. *Per vaginam* the characteristic softening of the cervix and vagina with ballottement will give efficient aid, and late in pregnancy the distinct sensation of a child in the uterus is unmistakable. With these means for arriving at a correct conclusion at our disposal it hardly seems possible for this mistake to occur, and yet it has been made many times, and by men of large experience and skilled diagnosticians.

PREGNANCY (ABNORMAL); HYDRAMNIOS.—The rapid accumulation of excessive quantities of amniotic fluid usually in the earlier months of pregnancy may induce a condition which strongly resembles an ovarian or parovarian cyst. The mistake has often been made and the uterus tapped or the abdomen opened, not always with success. Tait says he knows of three fatal cases of tapping. It usually comes on in young primiparous women pregnant with twins, and the growth of the supposed tumor is very rapid. Great suffering may be produced unless aid is given ; often the urine becomes albuminous. With such a history our suspicions should be excited, and a careful examination made. The usual signs of pregnancy will be found to exist. There will be the Braxton-Hicks sign already mentioned, together with ballottement, which will serve to make a diagnosis. It must not be forgotten that the uterine wall will be exceedingly thin from the great distension. The child will be very movable, and ballottement is an easily performed and important sign. Such cases seem to be very rare in this country.

RETROFLEXION OF THE GRAVID UTERUS.—It is not to be forgotten that this condition may exist even as late as the sixth month of pregnancy, and give rise to a tumor in the abdomen the exact nature of which will be difficult to determine. The vaginal touch will, to an inexperienced examiner, only tend to add to the confusion, for the cer-

vix will be drawn up and pushed firmly against the pubes, and behind it will be felt a tumor. If the bladder be distended, as it usually is, there will be two tumors in the abdomen, one softer and more fluctuating than the other—a condition sometimes met with in multilocular ovarian cysts.

The DIAGNOSIS must depend on the discovery of the true nature of the smaller cyst by the passage of the catheter, and then determining the fact of pregnancy by the usual symptoms, aided by the Braxton-Hicks sign.

EXTRA-UTERINE PREGNANCY.—If an ectopic gestation has lasted to the fifth or sixth month, its differentiation from a tumor of corresponding size may present many difficulties. The Braxton-Hicks sign is wanting, and we are forced to rely on the ordinary symptoms of pregnancy, fœtal movements, the fœtus being more than usually near to the examiner's hand, and auscultatory signs. The uterus is enlarged, but not enough to correspond with the supposed age of the fœtus, and is empty In the eighth or ninth month, or after the death of the child, which occurs usually at the end of the ninth month, the fœtus can be felt through the cyst-wall with great distinctness. The fœtal sac is generally much more on one side of the median line than on the other, which is seldom true of an ovarian tumor. Long and careful observation will be necessary in order to arrive at a correct opinion. In some cases the diagnosis can only be made by opening the abdomen, a procedure which will be fully justified if no signs of fœtal life exist.

HYDATIDIFORM PREGNANCY.—This condition has several times been mistaken for ovarian tumor (Peaslee). The ordinary signs of pregnancy are present, together with an unusual enlargment of the uterus and the escape of blood or bloody serum from the vagina. Small portions of the degenerated chorion may also often be found in the discharges.

HYDROMETRA.—Besides the enlargement due to pregnancy, the uterus is sometimes enlarged by a collection of fluid within it, due to other causes. The fluid may be serous or bloody. The accumulation may be due to a closure of the cervical canal. The growth is rapid, the patient suffering but little, and menstruation is absent, as it occurs in women after the menopause. Mr. Tait met with one case which he recognized only while operating. Should suspicion as to the possible nature of the tumor be aroused, a careful vaginal examination would probably solve the difficulty. The condition is very rare, and may end by spontaneous evacuation of the contents of the uterus.

HÆMATOMETRA.—In occlusion of the cervix or vagina, congenital or acquired, the menstrual blood sometimes collects in the uterus or below it in the vagina, so as to form a large fluctuating tumor, reach-

ing even above the navel. This condition is more common than hydrometra. Usually there is a history of an entire absence of the menstrual flow, but with a menstrual nisus, accompanied by severe pain. The diagnosis must depend on a careful vaginal examination, with the use of the uterine sound if the atresia exists in the uterus. Amenorrhœa is a constant symptom; Atlee refers to three cases met with in his practice.

PHYSOMETRA.—By this is meant an accumulation of gas in the uterine cavity. It is a very rare condition, and closely resembles tympanites in its physical aspect. As tympanites has been mistaken for a tumor, the same may occur with physometra, though it may seem inexcusable. The tumor is usually tense, tender, and may reach as far as the umbilicus. Unless the abdominal walls are very fat, tympanitic resonance will be marked and a vaginal examination serve to clear away all doubt. It usually occurs in hysterical women, and is often accompanied by an escape of gas from the vagina.

PHANTOM TUMOR, PSEUDO-CYESIS.—This curious condition, which is by no means rare, has never been satisfactorily explained. It consists of a spasm of the abdominal muscles, with a collection of gas which somewhat simulates a tumor, but is more apt to be mistaken by the patient herself for pregnancy. A curious fact is that often some of the objective signs of pregnancy are present, such as milk in the breast, noted by Tait. The "tumor" is sometimes on one side only, and again it apparently distends the whole abdomen and is tense and tender.

In a case recently seen by the writer it was noticed that the patient when lying on her back touched only the pelvis and the shoulder-blades to the bed. This was largely concealed by the soft elastic qualities of the bed, but on putting her on a hard table it was very noticeable; a good-sized pillow could be easily put under the lumbar region. Nothing would induce her to relax herself and lie flat, but under ether the whole "tumor" collapsed, and the spinal curve with it. The use of an anæsthetic is the key to the whole situation, and makes a diagnosis both easy and certain.

ASCITES.—Fluid accumulation within the peritoneum may cause an enlargement which will equal almost any ovarian cyst. As ascites is common, and as the mistake of opening the abdomen for a supposed tumor when nothing but dropsy exists has been frequently made, it is necessary to make the differential diagnosis very clear. In the first place, the history of the case and the expression of the patient may serve to make an approximate diagnosis at once. In ascites the *facies ovariana* is of course wanting. On inspection, the patient being in the dorsal position, there is little likelihood of mistaking ascites for an ovarian cyst unless the accumulation of fluid be very great. One glance to the experienced eye is often enough. With moderate ascites

the abdomen is flat instead of conical ; the walls are lax and the flanks bulge, the greatest diameter being just below the pelvis.   In the lesser degrees of accumulation the fluid will certainly gravitate to the lower parts of the abdominal cavity.   With the patient in the dorsal position percussion will give resonance in front over a circular or crescentic area, the concavity of which is toward the chest, while the flanks will be dull.   (See Figs. 349 and 350.)
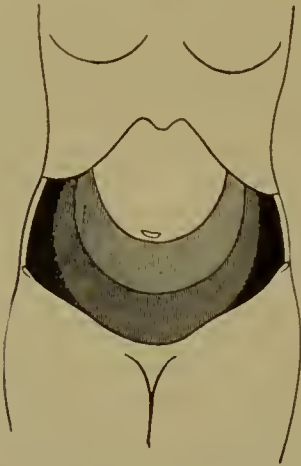
FIG. 349.   FIG. 350.

Diagrams showing Development of Areas of Dulness in Ascites (Fig. 349) and in Ovarian Tumor (Fig. 350).   Darker shading indicates an earlier stage of disease (J. Greig Smith).

By change of position the dulness disappears in one flank and becomes greater in the other, or if the patient sits up the fluid gravitates toward the pelvis and an area of dulness is discoverable above the pelvic brim.   When the distension of the abdomen is very great, so as to make the abdominal walls tense, the resemblance to a large ovarian cyst increases.   Still, the appearance is different.   The abdomen is flatter and less tense.   The appearance of the skin is not the same ; in ascites it is shining, tense, and smooth.   Although there may be dulness over the whole abdomen to the sternum in ascites, there will not be resonance in the flanks, as is almost universally the case in cystic disease ; there are very rare exceptions to both rules. Fluctuation is also much more distinct in ascites, the wave seeming longer and more decided than in ovarian cysts.   This, however, is not a distinction in parovarian tumors, and it is with them that most mistakes occur.   Nearly every parovarian cyst which has come under my notice has previously and repeatedly been diagnosed as ascites.

In very marked ascites a vaginal examination may be of service. Douglas' pouch is usually full of fluid, except where it has been obliterated by adhesions or a new growth, as in pelvic cancer, and may even

be forced out through the vaginal outlet, as in a case met with by the writer. Fluctuation is then easily detected. This may occur, however, from a small amount of fluid coexisting with a tumor.

Of all the signs, the history of the case, showing the existence of liver, kidney, and heart disease, together with the existence of dropsy elsewhere and the results of inspection, palpation, and percussion, especially the presence or absence of dulness in the flanks, are the most important and reliable. It must not be forgotten that ascites is a frequent accompaniment of an intra-peritoneal cancer.

Having excluded by the methods thus far discussed all those conditions which simulate ovarian and other tumors, we may safely conclude that a tumor does exist. Granting this, what are the signs which will prove to us that it is ovarian? How may we differentiate it from the other growths which more or less resemble it?

THE PHYSICAL SIGNS OF OVARIAN CYSTS.

These signs may be elicited by several means of examination, each of which must be considered by itself. For the examination of a large cyst we have, first—

Inspection.—Under this head we must consider inspection of the patient as well as of the abdomen. The facies ovariana already alluded to and the existence of emaciation must be looked for. On inspecting the abdomen it will be seen to be distended, either partially or fully. If partially, the principal enlargement will be in the lower portion, and quite generally greatest in the middle. Peaslee speaks frequently of tumors in the second stage as being on one side of the median line. This in my experience is a rare exception.

The distension is usually symmetrical, though this is by no means a universal rule. In multilocular cysts there is quite often a daughter-cyst which protrudes more at one point than another, making the outline of the tumor irregular. In this way the character of the cyst, whether approaching more nearly to the monocystic or the polycystic type, may sometimes be determined. Often the exact dimensions of the tumor, especially its upper line, may be made out.

If the tumor be very large the distension will be more symmetrical and the umbilicus may be prominent. It may even pout from coexisting ascitic fluid. The shape of the swelling differs entirely from that in ascites, being more globular or even conical, and without any bulging in the flanks. The skin is rarely tense and shining from œdema of the abdominal walls. The superficial veins are often enlarged, and linea albicantes may exist, similar to those found in pregnancy or other abdominal enlargements.

Mensuration.—As the tumor lies in the lower part of the abdomen,

unless it be of enormous dimensions, the greater part of the increase will be there. The distance from the pelvis to the umbilicus will be increased to a greater degree proportionately than from the umbilicus to the sternum. The broadest diameter, if the distension be great, will be at or above the navel, differing from that in ascites, which is greatest just above the pelvis.

Palpation.—The method of making palpation is important. The hand of the patient and of other physicians who may be bystanders should be withheld. Only one person at a time can properly examine an abdomen. The whole hand should be laid upon the abdomen and the finger gently pressed in and toward the tumor. In this way the character of the tumor can be made out. If not too large, it will be found to be round, smooth, and nearly globular. It may be freely or slightly movable, depending on its size and attachments and on the adhesions. Sometimes from the growth of secondary cysts the outline will be irregular, but still the surface will be smooth.

The degree of tenseness of the cyst may be appreciated, and, if the conditions are favorable, fluctuation recognized.

To get fluctuation, if the abdominal and sac-walls are both thin and the contents quite fluid, is very easy. One hand is laid on one side of the abdomen, and with the fingers of the other hand the opposite side of the abdomen is gently tapped. A wave or thrill will be felt, and often seen to pass directly from one hand to the other. In tense cysts with thick walls and moderately thick abdominal parietes a quite forcible blow with the finger-tips will sometimes elicit fluctuation when a lighter touch fails. If the abdominal cyst-walls are very thick and tense and the cyst divided by many septa, or the contents are a thick colloid, fluctuation may be entirely absent. I know of nothing so deceptive as a sense of fluctuation which is not absolutely certain. It is sometimes entirely impossible to decide whether in a given tumor fluctuation exists or not. In one case mentioned by Thomas after the tumor had been taken out and proved to be of a gelatinous consistency the sense of fluctuation was still apparently unmistakable.

Palpation will also often enable us to ascertain the presence of free fluid between the tumor and the abdominal walls. This, is done by laying the hand flat upon the abdomen and then, with the fingers held stiff and bent only at the carpo-metacarpal articulation, a sudden and somewhat forcible movement must be made. In this way the layer of fluid is suddenly displaced, and the finger-tips come upon the firm cyst-wall, which can be then easily recognized.

When the cyst is large and completely fills the abdomen, very often by a similar movement with the finger-tips just below the end of the sternum the outline of the cyst-wall can be made out when it can be felt nowhere else. Sometimes crepitus can be felt between the surface

of the tumor and the abdominal walls. It excludes adhesions at that point.

Atlee considered the propagation of the pulsation of the abdominal aorta through the tumor to be pathognomonic of ovarian cyst. It certainly is not felt in ascites, but may be in other cysts.

Percussion.—While inspection and palpation are very important, it is on the evidences obtained by percussion that we lay the most weight. As the tumor grows up into the abdomen it pushes the other movable contents of the cavity before it. In this way it soon comes to rest against the abdominal walls in front and upon the spinal column behind. Consequently, when we percuss over the tumor in front we find uniform flatness. To this rule there may be a few exceptions. The tumor may contain gas either from decomposition with suppuration or from a communication with an intestine, or rarely, and in the case of small tumors only, a portion of intestine may be attached to the front of the sac-wall. This I have met with but once, in the case of a small cyst in which there had been torsion of the pedicle and peritonitis. Again, the tumor may be so small as not to reach to the abdominal walls, which in turn may be very lax and pendulous. As the intestine and stomach, if the tumor be large enough, are pushed up before it, percussion will reveal a sharp line where one ends and the other begins—the "tympanic corona," as Tait calls it. If the cyst completely fills the abdomen, the corona will be more or less broken in upon. Still, it can generally be found in the epigastrium, as I recently proved with a cyst weighing seventy pounds, and in one or both flanks. This point Atlee insists upon as very important, but there may be exceptions, for the intestines in the flanks may be filled with feces or there may be coincident ascites, in both of which cases the flanks will be dull.

Auscultation.—There is little to be learned in a positive way by auscultation. The sound furnished by the movements of the tumor due to respiration, by intestinal movements, or by the blood in the large vessels is of no practical value. It gives negative signs by which pregnancy may be excluded.

Vaginal Examination.—By the finger in the vagina comparatively little of a positive nature can be learned. Very often the tumor cannot be even touched. Again, it will be distinctly evident to the finger; the uterus may either be pushed backward or drawn up in front of the tumor. If the tumor is low, fluctuation can be distinctly made out between the fingers within and without. The evidence to be obtained by the vagina is more in the way of excluding a uterine origin for the tumor in case of doubtful diagnosis. The rectal examination will throw little additional light on the case.

For the diagnosis of intra-ligamentary cysts Goodell claims much

aid can be derived from vaginal examinations. (See "Diagnosis of Character of Cyst.")

Two points still remain to be considered in this connection—exploratory puncture and exploratory incision. Unquestionably, both these procedures are now considered much less important than in times past. For this the same reason can be assigned. The extension of abdominal surgery has made an accurate diagnosis of the character of a given tumor of much less importance than formerly. When ovarian cysts were the only ones which it was thought·safe to remove a careful differentiation was a necessity. Hence every means possible was brought into requisition to enable one to make an accurate diagnosis before a removal was attempted. It has been found, however, that many other kinds of abdominal cysts, and even solid tumors, can be safely removed, and a mistake in diagnosis is therefore of less importance. Still, doubtful cases will arise where every possible means must be taken to arrive at a proper decision as to the probable nature of the growth. To this end the two procedures mentioned may be undertaken.

Exploratory Puncture.—The withdrawal of a small portion of the contents of an abdominal cyst for diagnostic purposes has been practised for a number of years. When Dr. Drysdale announced the discovery of the pathognomonic nature of his ovarian corpuscle, it received a new impulse, and for a while almost every tumor in which the slightest doubt existed was tapped and the fluid subjected to microscopic examination. Now, as Greig Smith says, "exploratory puncture has practically been abolished as a means of diagnosing ovarian cysts." With this opinion I would hardly agree, for, although I have not punctured a cyst for a number of years, I can imagine a case in which I might do so.

The objections urged against the procedure are that it is unsafe and uncertain. That it can result in serious trouble is well known; even the introduction of the hypodermic needle has been followed by suppuration of the sac and by peritonitis. The former danger can be obviated by strict antiseptic precautions—clean skin and clean needle. The danger of peritonitis—and the same may be said of hemorrhage —cannot be so easily avoided, as each is due to the puncture itself, a necessary part of the procedure. Through the hole in the sac a very irritating fluid may escape into the peritoneum and set up inflammation; the needle by passing through a large vein may produce a serious loss of blood. The uncertainty of the result depends on the fact that there are no absolutely pathognomonic cells or other appearances which can be relied upon for diagnosis. The Drysdale cells or corpuscles have unquestionably been found in cysts of the kidney. I have seen cells taken from such a tumor which corresponded exactly in appearance to the Drysdale cell and answered to all the tests. Garrigues[1]

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[1] *Am. Journ. Obst.*, vol. xv. p. 35.

has made the same observation, and has also found them in the cyst of the broad ligament, in vaginal cyst, in ascites, and in other cysts. Garrigues is of the opinion that "the most important elements are columnar epithelial cells seen on side view." While he does not maintain that they are pathognomonic, he says that they show that the fluid comes from a cyst which is lined with columnar epithelium, and therefore that it is not ascites or fluid from a uterine fibro-cyst. Bennett's corpuscles are of no diagnostic value.

While all this may be true, the presence of a large number of Drysdale cells in a possible ovarian fluid must be taken as strong evidence on the positive side. The chemical evidence is no more positive, and the absence or presence of paralbumen is not conclusive, although its presence probably excludes ascites.

The specific gravity of the fluid has some bearing in the same direction. According to Spiegelberg, the density of ovarian fluid averages from 1.018 to 1.024, ascitic fluid being only 1.010 to 1.015. The paper of Dr. Garrigues above referred to is very exhaustive. The method of withdrawing the fluid is simple. An aspirator or hypodermic syringe may be used, strict antisepsis—that is, cleanliness—being absolutely necessary in order to avoid trouble.

The Exploratory Incision.—Opening the abdomen for purely diagnostic purposes has, in ovarian cystic diseases, a very limited usefulness. But the exploratory incision has another and wider field of application. While the mere presence of an ovarian cyst may be almost always diagnosed with sufficient certainty to warrant operative interference, the exact condition of affairs within the abdomen, the absence or presence of adhesions and other complications, some of which may render an operation impossible, cannot be so readily made out. Thus in a certain sense every laparotomy for suspected ovarian cyst becomes an exploratory incision. Every exploratory incision should end in a completed operation if it be found possible. The risk of simply opening the abdomen unless cancerous disease be present is certainly very slight, provided of course that it is done with proper care. By proper care is meant the absolute preservation of an aseptic condition and not injuring the parts within the abdomen in any way. If there is good ground for suspecting cancerous disease, the risk of operating is greater, and unless the doubt is considerable no operation should be undertaken. In this I do not include solid ovarian sarcomata.

DIAGNOSIS OF THE CHARACTER OF THE TUMOR.—A careful examination will reveal much besides the mere fact that an ovarian cyst exists. True ovarian monocysts are very rare, but many tumors approach quite closely to the monocystic type. This may be made out by the uniform and smooth outline and special shape of the tumor. If

there are irregularities or projection of one portion more than another, the tumor is quite surely a multilocular cyst. As to whether there are two separate cysts, it is seldom possible to determine unless they are quite small and move independently of each other.

The intra-ligamentary cyst has certain peculiarities which sometimes enable us to distinguish it from the ordinary ovarian cyst. Dr. Goodell has described the diagnostic features of this form of tumor so fully that it is not necessary to repeat their description. (See p. 829.) While the existence of a number of the signs mentioned by him in a given case make the diagnosis of this kind of tumor probable, it must not be forgotten that a malignant growth may produce a series of phenomena which will bear a very close resemblance to them.

The character of the fluid may be made out to a certain extent by the sense of fluctuation. If the wave be short, quick, and very distinct, the fluid is probably thin. If, on the contrary, the wave seems to move slowly and to be indistinct, the fluid is probably thick. This is a matter, however, of very slight importance.

ADHESIONS.—Sir Spencer Wells claims that much can be learned by examination as to the nature of the adhesions in any given case. He relies on the respiratory movements and on percussion and auscultation. A considerable experience has convinced the writer that it is rarely possible to tell anything about adhesions. The existence of free fluid between the cyst and the abdominal walls is perhaps as sure evidence of the absence of parietal adhesions as anything, but occurs rarely, and does not tell anything about the existence of pelvic adhesions, which are in reality the worst of all. With this exception I agree with Mr. Tait, who says : " There is no possibility of determining by inspection or any other method the presence of adhesions anywhere in case of an abdominal tumor." I once operated on a patient who had a small solid pelvic tumor which seemed to be freely movable within the abdomen, the parietes being thin and quite relaxed. On cutting down I found the peritoneal cavity so entirely obliterated by old adhesions that I could not find it at all, and was forced to abandon the operation. What is true of adhesions is also true of the diagnosis of the character of the pedicle.

DIFFERENTIATION OF OVARIAN CYSTS FROM OTHER TUMORS.

The tumors which are most apt to be mistaken for ovarian cysts are—

    Encysted dropsy of the peritoneum ;
    Tubercular peritonitis (encysted) ;
    Soft uterine myomata ;
    Uterine fibroids and fibro-cysts ;

Cysts of the broad ligament ;

Renal and other similar cysts.

ENCYSTED DROPSY OF THE PERITONEUM.—Sometimes, though the condition is a rare one, fluid collects in a portion of the peritoneal cavity, and is surrounded by exudations and false membranes, omentum and intestines making a pseudo-cyst. It usually occurs below the umbilicus, but may be found in any part of the abdominal cavity, and is rarely median. Such a cavity contains a thin fluid which fluctuates freely, and its walls are not usually tense. It does not have a clear outline, and a cyst-wall is hard to detect. On percussion resonance is sometimes found between the tumor and the pubes, an exceedingly rare event in ovarian cysts. Being surrounded by intestines, it is sometimes movable, and often seems to spring, as it were, from the intestines; the latter being adherent to the wall, the line of dulness remains the same in changing the patient's position. It usually contains a straw-colored fluid showing albumen and, some have asserted, ovarian corpuscles. While the signs may sometimes be enough to distinguish such an effusion from an ovarian cyst, in other cases a diagnosis is impossible and mistakes have been frequently made.

TUBERCULAR PERITONITIS.—Dr. W. T. Howard[1] has called attention to the difficulty of differentiating tubercular peritonitis with encysted fluid from an ovarian cyst. The only difference between this condition and the one just described is in its extent and cause. Here, instead of a small circumscribed collection of fluid, we have the whole abdomen occupied, as in ascites, but shut in at the same time by an inflammatory pseudo-cyst. If seen early such a case would show all the signs of an ordinary ascites, but after an adhesive peritonitis has shut up the fluid the similarity to ovarian disease is very strong. Spencer Wells describes such a case which he mistook for a thin, non-adherent, unilocular ovarian cyst. Atlee, Busey, and William Gardner have also reported cases. According to Howard, they occur early in life, generally under thirty years. They grow very rapidly, in from four weeks to eight months, and there is usually some sign of tubercular trouble in other organs. Dr. Gardner noted a red blush and œdema of the central part of the abdominal wall, which Loomis states is characteristic of tubercular peritonitis. The fluid withdrawn in Howard's case was a light straw color, and coagulated firmly on exposure to the air. With all these points to help a diagnosis may sometimes be made, but owing to the extreme rarity of these cases they are likely to be overlooked and mistakes in diagnosis to be made. If in doubt an exploratory incision, with free drainage if the diagnosis be confirmed, would be entirely justifiable.

SOFT UTERINE MYOMATA.—There are few conditions more puz-

[1] *Gyn. Trans.*, vol. x.

zling than a soft, smooth, round, single myoma attached by a pedicle to the upper part of the uterus. The sense of fluctuation is of course absent, but pseudo-fluctuation is present, which very closely resembles that found in a thick-walled, tense ovarian cyst with colloid contents, and which will deceive the very elect.

The signs obtained by percussion and inspection will throw little additional light on the case. The tumors sometimes grow rapidly, following quite close on a confinement. If the abdominal walls are thick with fat, the difficulties are still further enhanced. The history of the case will often be of value, but in general the symptoms resemble closely those of ovarian cysts. If menorrhagia be present, the chances are all in favor of a myoma, but this is not a constant symptom and may occur with an ovarian cyst. The facies ovariana is wanting, also the rapid emaciation. These two points should attract attention and lead to great care in making a diagnosis.

The vaginal examination is often of much value. Close fixation of the uterus to the tumor and considerable enlargement of the uterus are strong probabilities for the uterine origin of the growth. But the crucial point is the sense of touch, including the test for fluctuation. If this fail to determine whether the tumor is solid or contains fluid, exploratory puncture or an exploratory incision alone will decide. Very little is said in the literature regarding the difficulty of differentiating these two tumors. The writer must confess to having made the mistake several times, only discovering the error after an operation had been begun ; nor has he been alone.

UTERINE FIBROIDS AND FIBRO-CYSTS.—True solid uterine fibroids can rarely be confounded with ovarian disease. Their density and irregularity, as well as the history of the case and the almost certain involvement of the uterus, serve to make the diagnosis easy. With fibro-cystic disease of the uterus the case is quite different. These cysts are fortunately very rare. Spencer Wells says they occur in proportion to ovarian cysts as one to fifty—an experience which will exactly agree with that of the writer, he having met with three cases which were so diagnosticated, the correctness of the diagnosis in two of them having been proved by autopsy. They usually occur in middle life, grow very slowly, produce little effect on the patient's general health, and are not accompanied by emaciation or the characteristic facies. They attain enormous size. When palpated they sometimes resemble exactly a unilocular ovarian cyst ; in other instances the surface is quite irregular, hard in some spots and fluctuating in others. Sometimes hard fibroid masses can be felt connected with the cyst. On vaginal examination the uterus is generally found enlarged and closely attached to or growing into the tumor, as it were. On moving the tumor, if its size will permit, the uterus is found to move with it.

Hegar has recommended to etherize the patient, and then with the cervix drawn down by a hook to examine with two fingers in the rectum for the uterine connections.

The fluid contained in these cysts was thought by Atlee to afford a certain means of diagnosis. The peculiar spontaneous coagulation of a thin straw-colored fluid which often contained muscular fibres he considered to be pathognomonic of this disease. This, however, has been proved not to be the case. Other fluids coagulate spontaneously, and the writer as well as others has found smooth muscle-cells in ovarian fluid. In many cases, then, we will be forced to Tait's conclusion, that the diagnosis of fibro-cysts is a very difficult thing, and "that it is possible only in the hands of a surgeon who has made two or three previous mistakes." A consoling conclusion, at least for most of us!

BROAD-LIGAMENT OR PAROVARIAN CYSTS.—As a special section will be devoted to the consideration of these cysts, the subject of diagnosis will be deferred. (See p. 1084.)

RENAL CYSTS.—Cysts of the kidney, as well as cysts of the pancreas, spleen, and omentum, have all been mistaken for ovarian tumors. Such a mistake should only occur when the cyst has attained sufficient size to completely fill the abdomen. If small, their true attachment should be easily made out, at least their non-pelvic origin. In this way the history of the case—where it was first noticed and especially in which direction it grew—is of great importance. If renal cysts are rare, the others just mentioned are still rarer—so rare, indeed, as to be mostly mere objects of curiosity. The three kinds can seldom be distinguished from each other.

Renal cysts, unless beginning in a floating kidney which has been greatly displaced, always have their origin far above the pelvis and extend downward. They are at first on one side of the median line just below the false ribs. They grow very slowly, and do not produce the constitutional derangements met with in ovarian enlargements. On inspection they are rarely symmetrical, and on palpation they seem to have their origin in the lumbar region, where they are deeply and firmly attached. Percussion, even in large cysts, often shows a line of resonance between the cyst and the pubes; one flank is resonant, and often the large intestine lies in front and to one side of the tumor. If percussion does not reveal it, it can be recognized by palpation. The vaginal examination gives simply negative evidence. If the opposite kidney is sound and the secretory function of the affected kidney be destroyed, there will nothing abnormal be found in the urine. In some instances it will contain pus and blood or simply albumen.

The fluid from these cysts is usually light straw color, and according to Peaslee contains no albumen, though Greig Smith states that it

is albuminous. In rare instances a colloid fluid is found or the fluid contains blood. Cholesterin and "ovarian corpuscles" have been found in the fluid of these cysts.

While the tumors and conditions so far considered are most likely to be confounded with ovarian cysts, it is not to be forgotten that there are many other kinds of tumors met with in the abdomen, some or all of which may be confounded with ovarian cystic disease. Some of them will be fully considered in sections of this article that are to follow, and to which the reader is referred. Others are so far removed from the pelvis, and are so seldom met with, that their consideration here would be out of place. The writings on ovarian tumors of Atlee and Peaslee, as well as the work of Greig Smith on *Abdominal Surgery*, will supply all needed information. For the differential diagnosis of pelvic inflammatory effusions, hæmatocele, and abscess, as well as for diseases of the Fallopian tubes, the reader is referred to the articles on those subjects.

Dermoid Cysts of the Ovary.

"About one of ten ovarian tumors is either entirely or partially dermoid," says Greig Smith. This proportion is rather larger than that given by some writers, but may be accepted as generally correct. It is a curious fact that in the negro race the relative frequency of dermoids and cystomata is reversed. While true ovarian cysts are of extreme rarity, dermoids are quite common. This, while it cannot be explained, is of great importance from a diagnostic point of view.

The prevailing theory of the pathology of dermoid cysts makes their origin in some fault of development in the fœtus. Although born with the individual, they seldom show themselves before puberty, and may remain quiescent until middle life or even old age. When they begin to grow their increase is usually slow, and they rarely reach a great size, seldom weighing over ten or fifteen pounds. Consequently, they are usually found in the pelvis, and the symptoms they produce are referred to that region. Here they press upon and interfere with the functions of the bladder, rectum, and uterus. Sometimes, even when quite small, they become very tender and painful, causing difficulty in locomotion and dyspareunia. The menstrual congestion increases the pain, producing dysmenorrhœa. When large enough to reach above the pelvis, they are attended by the symptoms usual to ovarian cystomata. Quite often we find a dermoid growth united with an ordinary cystoma, usually of the colloid variety. When this occurs the compound tumor has all the characteristics of the ordinary cyst.

Dermoids are more liable to complications than cystomata. From their small size and their situation in the pelvis they are often injured in labor. They are particularly liable to inflammation and suppuration and decomposition of their contents, also to torsion of the pedicle and to rupture. They frequently rupture into the vagina or rectum. When this occurs, if suppuration has not already taken place, it quickly follows. The progress of the case is then extremely slow. The hair, skin, bones, and other similar tissues found in the sac cannot get loosened from their attachments, and by their presence prevent perfect drainage, granulation, and shrinkage of the sac. Thus the discharge may be kept up for years or until the patient dies of sepsis and exhaustion. If rupture takes place into the peritoneal cavity, peritonitis and death are quite certain to follow unless art intervenes to save the patient. Another complication which often occurs without rupture is peritonitis.

The diagnosis of dermoids cannot ordinarily be made unless their contents can be seen. This may be done as a result of their rupture or from an exploratory puncture. Then the characteristic fatty fluid with bones, hair, or teeth will make clear the true nature of the case. Occasionally bony plates may be felt through the abdominal walls in the sac. When small they may be mistaken for inflamed ovaries, pyosalpinx, or ovarian cystomata. An operation alone is likely to decide the true nature.

The prognosis of a pure dermoid differs from that of a cystoma, for dermoids grow much more slowly, may remain quiet for years, seldom attain a great size, therefore rarely kill unless some complication arises. The proneness to the complications already mentioned adds somewhat to the danger. If colloid degeneration is joined to a dermoid, the course of the disease is similar to that of a cystoma.

FIBROIDS OF THE OVARY.

Both fibromata and myomata of the ovary are asserted to exist, but clinically they offer no points of difference. Classing them together as "fibroids," they have certain clinical features which often enable us to recognize them. They are very rare. Sir Spencer Wells met with three cases in his first thousand ovariotomies; Greig Smith asserts that of all tumors (including malignant) of the ovary, not more than 3 per cent. are solid; Doran has never met with a fibroma; the writer has removed one undoubted ovarian fibroma.

These tumors rarely attain a great size, few having been met with larger than the adult head, and more often they are quite small, sometimes not larger than an egg. They grow very slowly, are usually freely movable, and seldom form adhesions. They are unaccompanied by

pain unless they are of large size. Their irregular shape, small size, and long narrow pedicle render these tumors very prone to be turned on their axis, and thus to produce torsion of the pedicle. This generally results in gangrene of the tumor and death. Another complication, which may almost be considered the rule, is the occurrence of ascites. The reasons for this are not well understood.

The diagnosis is not easy. They are with difficulty distinguished from malignant (sarcoma and carcinoma) tumors and from uterine fibroids. Malignant tumors, however, grow much more rapidly, are less freely movable; both may be associated with proportionately large ascitic accummulations. Fibroids of the uterus are usually closely connected with the uterus, are generally multiple, and are very rarely complicated with ascites. If, then, with a small, slowly-growing, solid tumor, which is freely movable and unconnected with the uterus, we find a considerable accumulation of fluid free in the abdominal cavity, we may with a degree of certainty decide that we have to deal with an ovarian fibroid. Such a series of favoring conditions is but rarely met with. Care should be taken to distinguish these tumors from the pregnant uterus.

Cystic degeneration of ovarian fibroids has been described. The diagnosis can very rarely be made, as they closely resemble uterine fibro-cysts and multilocular ovarian cysts.

As the operation is usually easy and safe, there can be no hesitation in recommending the removal of all ovarian fibroids after they have become large enough to cause the slightest inconvenience.

PAROVARIAN CYSTS OR CYSTS OF THE BROAD LIGAMENT.

The term "parovarian cyst" is now generally applied to a peculiar form of tumor which many authors think should be known as "cyst of the broad ligament." Be the nomenclature what it may, we generally understand by either of these terms a tumor which has certain clinical as well as pathological characteristics by which it may generally be easily recognized.

Parovarian are by no means as common as true ovarian cysts. I have been unable to find any tables showing the relative frequency of the two, but from experience I should say that they occur about as one to twenty-five. They usually grow very slowly, and affect the general health and comfort of patients very much less than do ovarian tumors. One recently met with had lasted from five to six years with the production of very little emaciation, loss of strength, or discomfort, although it weighed nearly thirty pounds. But there are exceptions. Tait met with two which had reached a great size in only five and seven weeks respectively, and one met with by the writer had attained

considerable size in a few months. There being usually no emaciation or suffering, the facies ovariana is wanting. On examination they are often mistaken for ascites. This was done repeatedly in every case which has come under my notice before a correct diagnosis was made and the case sent for operation. The reason for this is that the cyst-wall is, as a rule, very thin—like tissue-paper, Mr. Tait says—and the sac not being at all tense, but rather flaccid, the palpation wave is communicated with great force and rapidity in every direction, thus closely resembling dropsy. Again, the flaccid sac lies flat and not pointed or almost conical, as is often the case in ovarian cysts. The same rules as to the diagnosis of the presence of a sac rather than free fluid hold good as in ovarian cysts—dulness all over the tumor, with resonance in one or both flanks and in the epigastrium. From the soft, yielding character of the sac it is very difficult to actually feel it ; but this may sometimes be done by having the lower part of the abdomen forcibly pressed upon by an assistant while the surgeon practises palpation above. To distinguish them from ovarian cysts we have their monocystic structure, flaccidity, thin walls, and rounded symmetrical outline, together with the absence of constitutional disturbance. If tapped, the fluid is usually like spring water, containing little or no albumen and no cells. But to most of these rules there are exceptions. Tait met with a case in which the walls were half an inch thick, and both Tait and Spencer Wells have seen cases which were multilocular. The fluid also sometimes contains blood or pus, or is thick and colloid in consistency. These tumors are subject to about the same complications to which ovarian cysts are liable, especially rupture, suppuration, and torsion of the pedicle. The prognosis is better than in cystomata. As they do more or less harm, and are liable to certain complications, removal is generally advised.

Extra-peritoneal Cysts.

Mr. Tait[1] has described a rare form of tumor, formed from the patent urachus, which sometimes closely resembles ovarian and parovarian cysts. In the *Annals of Surgery* Dr. I. A. Freer has collected certain cases of a similar nature.

These cysts are frequently quite small, but several of Mr. Tait's twelve cases were very large, containing thirty pints or more. There seem to be two varieties of the tumor, but the distinctions between them do not seem to be very clear. They frequently communicate with the bladder, and sometimes rupture at the umbilicus. The walls are described as being formed of a " peculiarly gelatinous, friable material," sometimes containing smooth muscular fibres and lined with

[1] Tait : *Brit. Gyn. Journ.*, Nov., 1886.

epithelium resembling that found in the bladder. They occur usually in young women, the oldest of Tait's cases being forty-one years of age. They grow somewhat rapidly, and are very prone to suppuration, although in some of Tait's cases the fluid was described as clear. They often contain, besides this fluid, free floculi of "delicate omental membrane." When a communication with the bladder exists, it does not always allow of the escape of the cyst-contents, but by a valve action it permits the entrance of urine into the sac. When this occurs, decomposition of the urine and cyst-contents soon follows. If simple and no suppuration has taken place, these cysts may greatly resemble parovarian cysts; but if the contents have become putrid, hectic fever and the symptoms of sepsis will follow. Pain is not usually a prominent symptom.

The prognosis is usually unfavorable on account of the tendency to suppuration.

The diagnosis is difficult: cases have been mistaken for ovarian and parovarian tumors and for ascites. In well-marked instances, according to Tait, "the pelvic dulness is absolute, whilst the dulness which is obtained above the umbilicus is not so, although it is perfectly certain that the wave of fluctuation passes through one volume of fluid not intercepted by any cyst-wall;" or, expressed in another way, "on percussing the region of the abdomen the percussion note was absolutely dull, while it became more and more resonant as we went farther up toward the umbilicus and above it, yet the physical signs above the umbilicus were clearly those of encysted fluid."

The uterus generally seems to be quite fixed, and is sometimes covered on both sides by a double fold of the cyst-wall. In some cases it is displaced backward.

The writer has met with a single instance of this disease. There was an opening at the umbilicus and into the bladder, which contained a large stone. The suppurating cyst was laid freely open and the stone removed through the vagina, a fistula being left for drainage. The upper opening into the bladder soon closed. Later, two openings were found in the wall of the sac. One led into a small dermoid cyst. Its contents, teeth, hair, and bone, having been removed, this soon closed. The other opening led into the small intestine near the stomach. Through this came a fluid which digested or dissolved everything with which it came in contact. As the patient's condition was very precarious, resection of the intestine was tried, but in her weakened state the shock of the necessarily long operation was too much for her, and she died soon after recovering from the anæsthetic.

Cancer of the Ovary.

The general clinical features of cancer of the ovary differ in no respect from those of cancer of other parts of the peritoneal cavity. Rapid growth, quickly-increasing emaciation, and loss of strength are among the most striking features. Pain, burning and lancinating in character, which is popularly supposed to be a necessary accompaniment of cancer everywhere, is really a rare symptom. In not one case of ovarian or intra-pelvic cancer met with by the writer has pain been very prominent, and in many cases has been absent altogether. The pressure and tension from an ascitic accumulation, when existent, has caused more pain and discomfort than the growth itself, as shown by the relief afforded by tapping. In nearly every case sooner or later ascites develops and increases with great rapidity, returning more and more quickly after each tapping. The cases of large solid carcinoma without involvement of surrounding tissues sometimes afford an exception to this rule.

The cancerous cachexia is developed late, and differs markedly from the emaciation and loss of strength met with in ovarian cystomata. Disturbance of the digestive organs is usually developed very early, making it very difficult to sustain the patient's strength. Constant vomiting and nausea are met with, especially toward the latter end of the disease.

The duration of ovarian carcinoma varies with the kind. Although the growth may increase very fast, the patient does not lose strength proportionately. In some cases of hard cancer several years may elapse before the end is reached. In other cases of rapidly-growing soft cancer even a few months may bring the patient to death's door. There can, then, be no rule as to the time a patient may be expected to live after the disease is once detected, though probably few will last more than two years. The writer can advise that in making a prognosis the attendant should be careful not to predict the end too soon. Many cases have lived for months after they have been given up to die.

The diagnosis of cancer often presents very great difficulties. Sometimes the previous history of the case will afford material assistance. As carcinoma of the ovary is often secondary to cancer elsewhere, the occurrence of a solid ovarian or pelvic tumor after the extirpation, for example, of a cancerous mamma, should always be looked upon with the greatest apprehension. So, again, the occurrence of a solid pelvic tumor soon after the operation of ovariotomy should be viewed with suspicion. Tait, Thomas, and other observers, as well as the writer, have repeatedly seen cancer in the other ovary follow in a short time the removal of one ovary for cystic disease. This I have observed in

five cases within a few years, and in none of them was there any reason to suspect that the original disease was malignant. The diagnosis of carcinoma cysticum can hardly be made before an operation, though its presence may be suspected by the rapid growth of the tumor and failure of the patient.

With a large solid tumor the diagnosis must lie between carcinoma, sarcoma, fibroma, and uterine myoma. Slow growth and general good health will be on the side of fibroma or myoma, while rapid growth and marked general disturbances of nutrition soon follow the malignant tumor. The myoma will be more or less intimately connected with the uterus, as may be determined by vaginal examination. In several cases of malignant tumor of the ovary seen by the writer there was an evening rise of temperature amounting to three or four degrees. With small tumors the occurrence of ascites is by no means characteristic, as it is a frequent concomitant of fibroids of the ovary. While in a given case, owing to the frequency of cancer and the rarity of fibroma, the chances may all be in favor of the malignant nature of the growth, still only careful watching can decide. The rate of growth will be the most important point in enabling one to arrive at a correct conclusion. Fibroids of the ovary grow very slowly.

When a tumor begins to infiltrate the surrounding organs, by both abdominal palpation and vaginal examination certain characteristic points may be made out. By palpation of the abdomen the outlines of the tumor will be firmly fixed, and if very uneven small isolated points may often be recognized. In order to fully appreciate this it may be necessary to first draw off the ascitic fluid. By the vagina there will be a stony hardness all over the pelvic roof, with sometimes here and there nodules rising to greater prominence.

Cancer is eminently atypical in every way, and it is impossible to predict or describe a regular course for the disease. As it sometimes closely imitates other diseases, we may be driven to a diagnosis by exclusion; and after having eliminated every other possibility, if we are still in doubt, but one resource remains—viz. exploratory laparotomy. In this way alone can we decide with positiveness, but it is not to be forgotten that the dangers of laparotomy with cancer are slightly greater than when the disease does not exist.

SARCOMA OF THE OVARY.

Ovarian sarcoma, as has already been stated, is rather more common than carcinoma. Among 147 cases of ovarian tumor recently recorded by various operators[1] there were six sarcomata and five carcinomata. Clinically, sarcoma does not materially differ from true cancer. It is

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[1] *Pittsburg Med. Review Supplement*, 1888.

almost equally malignant, although the tendency to return after removal is not always as great. There is no tendency to invade contiguous tissues, although metastases are more common. Ascites is not quite so common as with carcinoma. Pain is not usual except from extreme distension. Sarcoma usually forms rounded, smooth, hard tumors. Both ovaries are very commonly affected. The tumors are usually movable unless too large, and are not often adherent. The chances of being able to distinguish this tumor from any of the other solid ovarian tumors are very few indeed. There is no certain rule by which it can be done. The same may be said of the still rarer form of solid ovarian tumor, enchondroma. Many sarcomata have been successfully removed, the operation differing in no respect from that of an ordinary ovariotomy except in the length of the incision.

DISPLACEMENTS OF THE UTERUS.

By GEORGE T. HARRISON, M. D.,

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HISTORICAL.—There are passages to be found in the writings of Hippocrates, Moschion, and Aëtius which prove that inclinations of the uterus before and behind were not unknown to the ancients. It is, however, exceedingly probable that these old authors had knowledge only of deviations which had occurred in impregnated uteri. In 1732, according to Winckel,[1] Kuhn or his pupil Reineck is said to have demonstrated in the corpse the existence of retroversion of the gravid uterus. Previous to this century only isolated cases of displacement, forward or backward, of unimpregnated uteri were published, which were either accidentally discovered in the corpse or came to the knowledge of the physician by reason of symptoms which possibly were due to the complications. In 1817, Schweighauser published his views upon this subject founded on quite extensive experience, and maintained that backward dislocation in the unimpregnated was more frequent than in pregnancy. Flexions were considered as much rarer than versions. After Simpson, Huguier, and Kiwisch had introduced the use of the uterine sound the frequency of uterine deviations was generally recognized. In this country the writings of Dewees, Meigs, and Hodge were useful in disseminating a knowledge of this subject, while later the views of J. Marion Sims were undoubtedly of so suggestive a character as to lead to valuable investigations in this field. No one writer, however, who has discussed this theme has produced such a change in current views as B. Schultze of Jena. To him is indisputably due the great merit of having directed investigation into the right channels.

PRELIMINARY OBSERVATIONS.—It is a matter of paramount importance, before entering upon a consideration of the pathological changes in the position of the uterus, to ascertain in the first instance what its normal position is. In the first volume of this work the writer of the article on the Anatomy of the Female Pelvic Organs did not find himself called upon to enter on this subject at any length, and

[1] *Lehrbuch der Frauenkrankheiten*, p. 336.

hence the necessity of discussing it here. In our country Van de Warker[1] and Foster[2] have written excellent articles on this question based on original researches, which are well worthy of careful perusal. Dr. Ambrose L. Ranney's brochure upon *The Topographical Relations of the Female Pelvic Organs* contains a most thorough discussion of this whole subject. For my own part, from careful clinical observation I am convinced that the doctrines advocated by Schultze are, in the main, correct, and in the following discussion I shall follow his exposition, though I shall not adopt his views *in toto* unreservedly. That the normal position of the uterus cannot be decided by an examination of the cadaver, as anatomical questions ordinarily must be, is now agreed upon by all gynecologists. The reason is obvious : after death, with the cessation of the circulation, the uterus and neighboring organs lose their tonicity, the muscles of the pelvis become relaxed, the intraabdominal pressure ceases, and the uterus, obeying the laws of gravitation, falls backward, the corpse being supposed to occupy the usual dorsal decubitus. This is the position usually figured by the anatomists, notably by Henle. Nor can it be admitted that investigations on recently frozen cadavers are fitted to settle this question definitively, as affirmed by some distinguished anatomists. One of the most recent writers upon topographical anatomy, Henke,[3] insists that the retroversion found in the corpse is the normal position in the living woman. He believes that when gynecologists perceive the uterine body in front of the portio vaginalis they feel the firmly-contracted bladder, and in order to make this interpretation of the results of gynecological palpation the more probable he gives a profile view of a female pelvis, with two hands in the act of bimanual palpation, and between the finger-tips bladder and urethra. Well remarks Küstner : "We poor gynecologists, who with our touching fingers grope around in the darkness of inexactness, look up reverently and expectantly to the mother of all medical science, anatomy, and this is the light of the explanation which she affords us." As anatomical investigation in this instance leads us astray, the only other means at our command to solve this problem is observation on the living woman. Now and then, in the performance of laparotomy, the opportunity is afforded us of studying the normal pelvic organs of the female. Ordinarily, however, we must have recourse to our sense of touch to ascertain the position of the uterus in the living woman. And I am convinced that all experienced gynecologists who have thoroughly mastered the art of bimanual palpation so as justly to lay claim to the *tactus eruditus* will agree with me when I assert that this method of examination, a few rare cases excepted,

[1] *N. Y. Medical Journal*, xxi. p. 337, and *Am. Journ. of Obstetrics*, vol. xi. p. 314.
[2] *Am. Journ. of Obst.*, xiii. p. 30.
[3] *Topographische Anatomie des Menschen*, Berlin, 1884, p. 407.

when carefully practised with elimination of all sources of error, is fully competent to determine the position of the uterus in the pelvis. Schultze, and after him Foster, have devised methods to determine with perfect accuracy the position of the uterus in the living woman, for a description of which the reader who is interested in this subject will do well to consult the paper of Dr. Foster to which reference has already been made. Fritsch makes the criticism that, " since the womb is normally movable, we cannot speak of a definite normal position. The entire number of positions of the womb are normal in different physiological conditions of the neighboring organs." This criticism loses its force if we bear in mind that the definition of the normal position includes, as an essential part, a considerable degree of mobility on the part of the uterus and the spontaneous daily occurrence of definite changes in its position to a greater or less degree. Bimanual palpation reveals the fact now that the normal uterus, the bladder being empty and the rectum either empty or moderately filled, is inclined forward, with its fundus behind the symphysis, the os uteri being situated about 2 em. from the point of the sacrum, and the angle between vagina and cervix being almost a right angle in women who have never been impregnated, while in women who have borne children it is usually more acute. The position of the uterus is, moreover, normally, never quite median, since the anterior surface, turned to the bladder, looks forward and to the right, and consequently the fundus is slightly rotated to the right and the vaginal portion to the left. In a word, the normal position of the uterus when the bladder and rectum are empty is that of anteversio-flexio, the place of flexion being at the junction of cervix with body.

This, which is the usual position, is subjected to physiological changes of quite a marked degree. In the first place, the uterus is under the influence of the intra-abdominal pressure in its variations. The effects of the ordinary respiratory changes of the intra-abdominal pressure are slight, but perceptible, the fundus uteri being depressed upon the bladder and the vaginal portion moving toward the sacrum. This deviation of the vaginal portion can be readily observed in the use of the Sims speculum. When the intra-abdominal pressure is increased the uterus is displaced downward to a considerable extent; but when there is an intermission of this pressure it ascends again, and when the intra-abdominal pressure becomes negative the uterus may even ascend into the abdominal cavity, while the vagina becomes filled with air, as is well seen when the patient is made to assume the knee-chest position and Sims' speculum is introduced.

The uterus is influenced to a much greater extent, as regards its position, by the varying degree of fulness of the bladder, to a less degree by the state of the rectum. The coils of intestine which are found in

Douglas' pouch ordinarily escape into the general peritoneal cavity when the rectum and bladder are distended; but when these organs are empty they lie in the pelvic cavity, forming material to fill up interspaces. As the bladder becomes filled the uterus is slowly elevated and displaced backward, and the farther it recedes the more the intestines are

Fig. 351.

Physiological Position of the Uterus when Bladder and Rectum are empty (after Fritsch).

displaced from the pouch of Douglas, until finally, when the bladder is distended, the uterus lies in juxtaposition with the anterior wall of the rectum: it is both retroposed and retroverted. As the bladder becomes emptied the uterus gradually returns to its former position of anteversio-flexio, the explanation of which is obvious when we consider that, in the first place, the cervix is maintained in a position near the sacrum by the recto-uterine ligaments (ligamenta retractores, Luschka); and secondly, in consequence of its subperitoneal attachment to the bladder at the upper part of the latter, it must follow the collapsing bladder-walls. It is to be borne in mind that when the bladder is evacuated of its contents the walls are brought into apposition in such a manner from above downward that the largest diameter lies in the conjugate axis, the upper surface presents a concavity toward the abdominal cavity, and above this depression lies the anterior wall of the uterine body. A median section of the empty bladder is not globular, but, as Schultze expresses it, is like a saucer or dish. The intra-abdominal pressure is an essential factor in maintaining the normal position of the uterus. When this organ becomes anteverted in

consequence of the evacuation of the contents of the bladder, the posterior surface of the uterus, now the upper, falls under the influence of that pressure, the anteversion is increased, and, when normal flexibility exists, flexion is superadded. The flexion, according to Schultze, is exclusively the effect of intra-abdominal pressure; the contraction of the bladder can only antevert the uterus. The fundus uteri describes an arc which corresponds to an angle of 45° to 60° when the bladder, previously moderately full, is emptied. Normal daily changes in the position of the uterus are produced by the filling and emptying of the rectum. The descending column of fecal matter necessarily displaces the vaginal portion forward, and in doing so places the *retractores* on the stretch. If the bladder is empty and the flexibility of the uterus considerable, the effect is an increase in the degree of flexion; if, on the contrary, the flexibility is slight, the entire uterus is displaced forward. If, however, at the time of the voidance of the contents of the rectum the bladder is full, there is neither space for a marked degree of flexion nor forward displacement, and the uterus is straightened and pushed upward. The influence of the rectum in changing the position of the uterus is normally of short duration, and comes into play at stated intervals, for the portion of the rectum below the retractores is in the greater part of the day almost or quite empty, and only a short time before or during the act of defecation is it distended by the descending column of fecal matter.

After the evacuation of the rectum the uterus is restored to its normal position mainly by the contraction of the recto-uterine ligaments. The attachments of the uterus to its neighboring organs are, however, so yielding that temporarily the cervix can deviate to a decided extent forward and the fundus to a marked degree backward. Accordingly, it will be seen that the uterus undergoes daily excursions of no mean degree, which are to be regarded as physiological so long as they are produced by determinate causes and are of a transient character, and provided the uterus returns to its normal position after their removal.

The movements of the uterus hitherto considered are brought into play by forces generated in the body of the woman herself. It is also important to understand the nature and extent of the passive mobility of the uterus, or, in other words, to know the movements which we have it in our power to communicate to this organ. It is possible, both by means of instruments and by the examining fingers, to impart a variety of such movements. By means of the finger in the vagina we can displace the vaginal portion backward and upward in the elongated vaginal axis to the extent of several centimeters, and, according to the flexibility of the uterus or the reverse, we either force the anteflexed uterus into a condition of anteversion or increase the already existing anteversion. We can also communicate to the uterus the oppo-

site movement by aid of bimanual co-operation, the finger in the vagina drawing the portio vaginalis forward, while the other hand, through the abdominal walls, first elevates and then retroverts the organ. The uterus can also be elevated and depressed.

Other movements, passive in character, of which the entire organ is susceptible, are those of *anteposition* and *retroposition*, by which terms we mean the displacement of the entire organ in the corresponding directions. *Dextroposition* and *sinistroposition* are only possible to a very limited degree in the normal uterus. Again, the vaginal portion may be displaced to the left *per vaginam*, while through the abdominal coverings the fundus is moved to the right, constituting *dextroversion*. Similarly, of course, *sinistroversion* may be produced. Finally, the uterus can be rotated about its longitudinal axis by the sound to the right or left, to a limited extent.

If the uterus oversteps the limits of the normal in any one of the directions in which its daily excursions take place, it is no doubt correct to say that the positions assumed by it at times are anomalous; but if it is able to return spontaneously to its normal position after the transient cause of the abnormal excursion has ceased to operate, we could not term the latter a displacement in a clinical sense. In the language of Schultze,[1] "Changes in the position of the uterus only become displacements in the clinical sense when they are more or less *stable*. Limitation or hindrance of the normal movements of the uterus is a main characteristic of its displacements." At first thought this statement may seem incompatible with palpable facts, because it is well known that a dislocated uterus may remain abnormally movable and execute at times abnormally extensive movements: though this be true, nevertheless it will be observed that the definite normal movements of the uterus are obstructed or are completely wanting. Let us now study the various displacements in detail.

ANTEVERSION.

ETIOLOGY AND PATHOLOGICAL ANATOMY.—When the uterus is so infiltrated, thickened, and rigid as a result of inflammation that the physiological angle of flexion, corresponding to the inner os uteri, is diminished or abolished, so that the uterine axis is straightened, we have a pathological change before us constituting *anteversion*. To the definition of anteversion should be added, according to Fritsch, the further postulate of a perimetric process which fixes the lower end above and the upper end below. The uterine parenchyma and the adjacent peritoneum will consequently show pathological changes. In anteversion we may therefore always expect to find peri- or parametri-

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[1] *Die Path. u. Therapie der Lageveränderungen der Gebärmutter.*

tis and metritis, usually in a chronic form. The entire uterus, especially the transition of the cervix into the body, is abnormally swollen, thickened, and rigid. The body occupies nearly a normal position, being, however, pressed downward upon the bladder to a greater degree than is usually the case; but the cervix deviates to such an extent from the normal direction that the external os uteri looks directly backward toward the hollow of the sacrum.

Anteversion can be produced not only by a posterior fixation, but also by an anterior. Tube and ovary of either side can be attached by perimetric adhesions to the front part of the pelvis, and these may be so firm that the fundus cannot be lifted even by the application of considerable force. Fritsch does not believe that an attachment directly in front ever takes place, on account of the intervention of the bladder between the symphysis and the uterus. If, on the other hand, the connections of the uterus with its neighboring parts are relaxed and yielding, considerable changes can take place in the position of the stiff organ according to circumstances. When the bladder is empty and there is an increase of the intra-abdominal pressure, the body descends lower, and can be felt immediately above the anterior vaginal wall to its full extent, while the os uteri looks upward and backward toward the promontorium. As to how the anteverted uterus will behave when the bladder is full or distended will depend on whether there is fixation or not. If there are adhesions which fix the uterus, it will persist in the anteverted position no matter how full the bladder becomes, but if the uterus is movable, as the bladder becomes filled it will be lifted up so as to lie in the pelvic axis in its rigid form. When the bladder is detached from its connection with the cervix, it will not alter the anteverted position of the uterus, as in filling it rises between fundus and symphysis.

The causes potent in the production of anteversion are such as are effective in evoking metritis and para- or perimetritis. Especially worthy of mention are—defective involution in the puerperal state, notably after abortions; lacerations of the cervix, and more particularly those involving the parametrium; and, finally, acute and chronic inflammatory conditions attended with connective-tissue hyperplasia. Corresponding to its etiology, the uterus is enlarged, thickened, and either engorged with blood, and so rendered rigid, or else unalterably stiffened by contraction of the connective tissue in the parenchyma. These conditions are frequently associated with parametritis posterior, as the result of which shortening and rigidity of the recto-uterine ligaments take place, and thus the anteversion is increased in degree and made permanent. The frequent complication of perimetritis after what has been said before need scarce be mentioned again.

SYMPTOMS AND COURSE.—As anteversion is a consequence or

accompaniment of metritis, parametritis, or perimetritis, it needs no extended argument to show that the symptoms are called forth by these complicating affections. Schroeder directed attention to a group of symptoms which are not usually attributed to anteversion, but which are undoubtedly dependent upon this condition, and owe their origin to a condition of things the reverse of what are usually found here. According to this author, if the abnormally heavy uterus is not maintained in a fixed position by the relaxed ligaments, it changes its position not only in obedience to the varying degree of fulness of the bladder, but also with each changing posture of the body. The sensation of movement on the part of the sensitive uterus calls forth very disagreeable feelings, and is a source of constant annoyance to the patient. If the uterus, however, is fixed in the anteverted position, it produces disturbances in the functions of the bladder which manifest themselves usually in frequent or difficult micturition.

Important symptoms are the anomalies of menstruation, depending not only on the inflammatory condition of the uterus, but also on its altered position. The metritis or perimetritis may undergo recrudescence during menstruation, and hence the anteverted uterus can pour forth large quantities of blood at this time : in a word, menorrhagia is a symptom by no means infrequent. Dr. Thomas[1] mentions the fact that, in exceptional cases, locomotion is affected by this condition, and he further states that four patients who thus suffered were relieved by the use of an anteversion pessary in each case. These cases doubtless came under the category above mentioned first described by Schroeder, in which the anteverted uterus is movable and discomfort is evoked when the organ is displaced by the movements of the patient. When the acute or subacute inflammations have been relieved the patient may feel perfectly well, although the abnormal position still persists ; the bladder becomes accustomed to the new form of dilatation to which it is necessitated by its relations, as in pregnancy.

DIAGNOSIS.—The diagnosis offers no difficulty of any moment when bimanual palpation is called into requisition. The portio vaginalis is found directed behind and above, the body lies on the anterior vaginal wall, and the fundus is directed toward the symphysis, while the angle of normal flexion no longer exists. There is no necessity for the use of the sound for diagnostic purposes. Hart and Barbour[2] call attention to the difficulty in differential diagnosis " when there has been inflammatory deposit in front of and around the cervix simulating the anteverted fundus. In these cases the combined examination is difficult from existing inflammation. The examination with one finger in the rectum enables us in such cases to ascertain that the fundus uteri is at least not lying to the back."

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[1] *Diseases of Women*, p. 408.   [2] *Manual of Gynecology*, 3d ed., p. 341.

TREATMENT.—Since anteversion is not a disease in itself, treatment to be rational must be directed to the morbid process producing it. All the varied forms of anteversion pessaries, upon the construction of which so much ingenuity has been expended, are unnecessary and superfluous —nay, are often injurious—and the hypothesis which suggests their employment is incorrect—*i. e.* that the fundus can be acted on through the anterior vaginal wall. When the inflammatory complications have been removed to such a degree that they exhibit no more signs of activity, and the annoyances from which the patient suffers are due to dragging or perimetric adhesions in walking, or when the connections of the anteverted uterus are relaxed,—under these circumstances an elastic ring of soft rubber or the Emmet pessary with very slight curve will afford relief as a rule, the explanation of the beneficial action of such a pessary being that the bar, lying in the posterior fornix vaginæ, prevents the deviation of the portio backward and maintains it in a more erect position ; consequently, as the body is rigidly united with the cervix, the whole organ is hindered from occupying the extreme position of anteversion, and at the same time is restrained from frequent and excessive movements. Having regard to etiology, the treatment must therefore be mainly directed to subduing the irritative conditions of the uterus and its vicinity. Hence hot-water vaginal douches are indicated. The use of the wet pack to the hypogastrium and sitz-baths is also attended with good results. Scarifications of the portio repeated from time to time are very useful in relieving the hyperæmia. The application of iodine to the portio and vicinity is certainly beneficial in its effect, however we may explain its mode of efficacy. The repeated use of borated cotton saturated with glycerin and inserted in the posterior fornix vaginæ is indicated.

For the menorrhagia which is so often attendant upon anteversion hydrastis is a most excellent drug. The use of ergot, continued for some time, has been praised by many. It is well to bear in mind, however, the excellent remarks of Hart and Barbour in regard to the treatment of anteversion. " It is improbable," they observe, " that the mere anteversion of the uterus causes any distress. The ordinary statement, that the uterus when anteverted presses on the bladder, is open to the fatal criticism that the uterus always presses on the bladder, while, so far as mere weight is concerned, there are, in the majority of cases, no special symptoms referable to the anteversion of early pregnancy." This reasoning from analogy is not altogether favorable to their argument when the facts are carefully weighed, for it cannot be denied that urinary disturbances are nearly always present in the early part of pregnancy. It is true, however, that it is not the *anteversion*, but the *fixation*, of the anteverted uterus which causes the chief annoyance by interfering with the dilatation of the bladder.

It was to relieve the urinary disturbance in a patient that Dr. Sims was led to perform his operation on the anterior vaginal wall with the view of shortening this wall and at the same time elevating the uterus. This patient suffered from anteversion caused by a tumor situated in the fundus. Finding that the uterus could be lifted to its normal position by seizing the anterior lip of the os uteri and drawing the cervix down toward the urethra, the operation suggested itself to shorten the elongated anterior vaginal wall and attach the cervix to it. To that end two semilunar portions a half inch wide were cut out of the vaginal mucous membrane, one of them in juxtaposition with the cervix, the other an inch and a half in front of it, and the edges of the wounds were brought together by means of silver sutures, as in the operation for vesico-vaginal fistula. The sutures were removed after ten or twelve days, and the wounded surfaces were found united. The patient kept her bed a week longer. Says Sims : "The uterus was kept in its proper position by this wall constructed of vaginal tissue just as well as before by the tenaculum, and, fortunately, the patient was entirely relieved of the morbid symptoms of which she had complained so long before the operation." Unfortunately, we will not often find such a condition of things in anteversion as will indicate the performance of this operation of Sims; yet it is well to bear it in mind.

There is one operative procedure which I can praise in the highest terms from clinical experience : it is the amputation of the swollen portio vaginalis after the method devised by Schroeder, which consists in excising a wedge-shaped piece from the anterior and posterior lip, after first dividing the portio bilaterally down to the vaginal junction. As a consequence, the portio assumes a different position, and the tormenting symptoms are relieved because the chronic metritis is cured.

ANTEFLEXION.

ETIOLOGY AND PATHOLOGICAL ANATOMY.—There ·is no portion of the entire domain of gynecology which is in so unsettled a state in regard to its pathological significance as that which embraces the subject of anteflexion, and none as to which, it may be added, such diverse views are held. Hart and Barbour[1] give as their definition the following : "*Anteflexion* is merely an exaggeration of the normal condition." But, as we have seen, the normal uterus lies in a position of anteversion and anteflexion : it cannot be much more anteflexed than we find it under normal conditions. What better proof can be offered of the confusion which prevails here among writers than to refer to the paper of Vedeler,[2] in which the author states that among 3012 women examined by him he found 66 per cent. affected with *antever-*

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[1] *Loc. cit.*, p. 330.   [2] *Archiv für Gynäkologie*, Bd. xix. p. 295.

sions and *anteflexions,* and only 15 per cent. in whom normal positions could be demonstrated? After discussing the subject at some length, he attains to the conclusion that the position designated as the *pathological* is the *normal,* and the *normal,* so called, is the *abnormal* position of the uterus. Most lame and impotent conclusion!

Küstner[1] maintains that the terms anteversion and anteflexion as pathological conditions should entirely disappear from our terminology. We are not yet ready for so radical an innovation, for it seems to me that their clinical features are too well characterized, and convenience alone should justify the retention of the terms. The studies of Schultze are here epoch-making, and the theme, thanks to him, has been illumined by exact scientific observation to such a degree that our comprehension of it has been vastly facilitated.

In order that anteflexion become pathological it is a necessary antecedent that there should be rigidity at the point of flexion, which must be an acute angle, or posterior fixation; in other words there must be metritis or infarction, or parametritis posterior, or parametritis chronica atrophicans, or perimetritis. The causes which make the flexion of the uterus permanent are therefore either in the organ itself or operate on

Fig. 352.

Anteflexion produced by Cicatrization of Utero-sacral Ligaments (Schultze).

it from without. When metritis attacks the uterus fixed in anteflexion, the angle of flexion, which up to that time had been variable, becomes fixed. Again, partial shrinking of one wall and an increase of volume of the other can lead to a curvation or flexion of the organ over the shorter surface. Tumors with broad bases having their site in the posterior wall, as myomata or adenomata, can make rigid anteflexion. Very much oftener the causes which are potent in the production of permanent anteflexion lie outside of the uterus. Such causes as ovarian tumors, anterior peritoneal adhesions, shrinking of the ligamenta rotunda, can hinder the body of the uterus from making its normal

[1] *Die Normale u. Path. Logen u. Beweg. des Uterus,* p. 44.

excursions backward as the bladder fills. The most frequent cause by far, however, of pathological anteflexion is parametritis posterior or parametritis chronica atrophica (Freund). To E. Martin we owe the first recognition of the clinical fact that shortening of the sacro-uterine ligaments is a frequent cause of pathological anteflexion.[1] The most frequent causes of parametritis posterior are of non-puerperal origin, though often dating their origin from the puerperium. The puerperal parametritis posterior is due usually to ruptures of the perineum or lacerations of the cervix, and consequent septic infection. The exudation may be slight, the acute stage short, and the local pains not very marked. Such an inflammation is often—I ought rather to say is as a rule—overlooked. A typical case of puerperal parametritis came under my observation in May last, which I saw in consultation with Dr. S. B. Allen of this city, and which I may mention to show how little distinctive the symptoms usually are. Previous to this date Dr. Allen had curetted the endometrium and used intra-uterine injections on account of symptoms indicative, as he thought, of septic infection from retained remnants of placenta or decidual membranes : this occurred several days after the confinement. The symptoms became more favorable under this treatment, but after the lapse of several days there was a return of threatening symptoms. These consisted chiefly of an elevation of temperature, a slight degree of pain in the right inguinal region, and an increased frequency of pulse. Examination *per vaginam* revealed the existence of recent laceration of the cervix on the right side, and a parametritis could be demonstrated, involving the right recto-uterine ligament especially, which was thickened and tender upon pressure. I have had repeated opportunity of observing like cases. The use of the ice-bag to the abdomen soon brought about a decline of this inflammation.

In the unmarried, and in married women who have remained sterile, the parametric process is generally subacute or chronic from the beginning. This form may be caused by the frequent traction to which the recto-uterine ligaments are subjected in the passage of voluminous scybalous masses in obstinate constipation, to infection from the rectum in consequence of fissures, or to extension to the parametrium of endometric processes by reason of stagnation of catarrhal secretions.

The acute form of parametritis of non-puerperal origin is either traumatic and septic or of gonorrhœal origin. In the case of gonorrhœal infection the fixation is, however, not so often caused by a parametric as by a perimetric process, the disease extending from the mucous membrane of the cervix to the tube. The infectious matter then flows out of the abdominal end of the tube and attains to Douglas' pouch, the deepest portion of the peritoneal cavity, and leads here to inflammation

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[1] *Niegungen und Beugungen*, 1866 u. 1870.

and adhesion of the posterior wall of the uterus to the opposite perito-
neum, and thence shortening of the recto-uterine ligaments. Patho-
logical anteflexion, thus characterized, is one of the most frequent dis-
eases found among women. By many writers it is termed *acquired
anteflexion*, as distinguished from *congenital anteflexion*. Schultze ob-
jects to the term *congenital anteflexion*, because none of the conditions
belonging to this anteflexion as observed in the mature woman depend
on an anomaly already existing at the time of birth. He prefers the
term *puerile anteflexion*. It constitutes an arrest of development, in
which the uterus exhibits in its conformation a type proper to the
child. The characteristic features of puerile anteflexion are shortness
of the vagina, especially of the anterior wall, the slender conoidal form
of the vaginal portion, the os being often very small, a remarkably
long *portio intermedia*, the position of the cervix in the axis of the
vagina, and the excessive flexibility at the transition of the cervix into
the body of the uterus, in consequence of which anteflexion with a
very acute angle is produced. Transitions can take place from the
mature normally-developed virgin uterus, on the one hand, to an arrest
of development at the stage of childish formation. If a uterus the
seat of puerile anteflexion is attacked by parametritis posterior or a
perimetric process, by which the upper cervical section is carried up-
ward and backward, the anteflexion will exhibit an especially acute
angle. Such a uterus, when it loses its flexion and flexibility on
account of metritis, will not assume an anteverted position, but, on
the contrary, will become retroverted, because the vaginal portion, by
reason of its insertion and length, compels the cervix to lie in the axis
of the vagina, and the body, not being able to bend on the cervix,
must accommodate its position to that of the latter, and thence must lie
in the position of retroversion. Fritsch throws out the conjecture[1] that
there may be cases in which the short folds of Douglas are congenital,
and the anteflexion caused in this way. Graily Hewitt, whose writings
on flexions of the uterus are characterized by earnestness of conviction
and acuteness of reasoning, if not of observation, insists that in the
etiology of flexions *softness* of the uterus is a powerful predisposing
cause. He is convinced that it is a factor of the extremest importance
in bringing about anteflexion and version. It does play its part in
certain flexions, notably in retroflexions, but the importance attached
to it as an etiological factor by Hewitt cannot be sustained by clinical
facts. Dr. Emmet,[2] as is well known, distinguishes between flexion
of the cervix and flexion of the body, the first being the more fre-
quent. "Flexures of the cervix," he remarks, "have their origin
about puberty, or shortly afterward, by the balance being lost between

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[1] *Handbuch der Frauenkrankheiten Lageveränderungen der Gebärm.*, p. 29.
[2] *Principles and Practice of Gynecology*, 3d ed., p. 331.

the relative growth of the body and cervix. From the earliest devel-
opment of the uterus, as a rule, until pregnancy, some degree of ante-
version exists. With the uterus in this position the neck cannot be
developed to its full length without forcing the cervix forward in the
axis of the vagina, in the direction offering the least resistance. As
the body of the uterus lies forward, the cervix must become bent upon
itself at or near the vaginal junction, and thus the flexure is formed."
The views here advocated by this eminent surgeon are not at all in
harmony with my clinical observations. In a few cases, either by
original malformation or by acquired deformity, the vaginal portion
may be placed at an angle with the upper part of the cervix, and now
and then, as a great rarity, a bend may be found in the body ; but, as
we have repeatedly said, the typical place at which the flexion is found,
in ante- as well as retroflexion, is at the junction of the body with the
cervix, the point at which the uterus is fixed by the folds of Douglas
behind, and where the peritoneum of the anterior wall passes over to
the bladder.

SYMPTOMS.—The symptoms of pathological anteflexion are chiefly
those produced by the complications ; especially are they referable to
the parametritis posterior or the perimetritis.

It is unnecessary to dwell upon the symptoms dependent on the
complicating metritis or endometritis catarrhalis, but the parametritis,
as Schultze correctly insists, is an essential and characteristic feature
of the clinical picture of pathological anteflexion. In the acute form,
when it occurs in the puerperal period, the single symptom may be an
elevation of the temperature or acceleration of the pulse, and without
an accurate exploration of the uterus and its vicinity by the combined
examination a true diagnosis is impossible. The rectum gapes widely,
because the surrounding parts are rigid from the exudation, and do not
collapse when the former is empty. In the cicatricial stage the folds
of Douglas shrink and draw the uterus up toward the sacrum. The
rectal space is encroached upon now by the approximation of the folds,
and the passage of fecal matter gives rise to pain—nay, at times to
recrudescence of the inflammatory process. In the chronic stage, or in
that form which is chronic from the beginning, the complaints of the
patient are referable chiefly to the rectum. In some cases there is
severe pain just before the evacuation of the rectum ; in others, the
pain is not so intense, but a most disagreeable sensation in the pelvis
after a stool is the subject of complaint. When the stenosis is consid-
erable in degree solid fecal masses find difficulty in effecting a passage,
and at times diarrhœa is observed of an obstinate character.

Disturbances of the functions of the bladder are frequently noticed
in the disease under discussion. Schultze refers them to the parame-
tritis posterior, and believes they are in part dependent on collateral

disturbances in the circulation and innervation of the bladder, but also in part are due to the traction which the posterior vesical wall suffers on account of the strong retroposition of the cervix, and to a very limited extent are they dependent on the pressure of the corpus uteri on the upper wall of the bladder. Emmet's[1] studies on pelvic cellulitis have led him to identical views. "One of the most distressing symptoms to relieve," he remarks, "is the irritation of, and the constant desire to empty, the bladder which sometimes exists after the more acute symptoms have passed away. Pelvic inflammation at any point may cause this disturbance, but it is more marked when it is situated in the utero-sacral ligaments." The reader will find his account in reading the remainder of this author's suggestive observations on this theme in his invaluable work, to which reference has been made. The bladder annoyances in question are, I believe, dependent on several causes, and besides those mentioned another is the interference with the normal expansion of the bladder.

There are two most important symptoms associated with pathological anteflexion which have led to animated scientific discussions, and their importance is enhanced by the circumstance that the principles of treatment must be largely dependent on the understanding we have of them: they are *dysmenorrhœa* and *sterility*. After the classification of the older medicine of dysmenorrhœa into various kinds was overthrown as scientifically inexact, the mechanical theory of dysmenorrhœa was generally adopted under the influence of the teachings of Sims. The doctrines enunciated by him are as follows: "I regard it as an axiom that no dysmenorrhœa, in the proper sense of the term, can exist when the canal of the uterine neck is straight and sufficiently wide to permit the escape of the menstrual blood; in other words, that the condition can only then occur when some sort of mechanical obstruction exists at some point between the inner and external os uteri or in the entire length of the cervical canal which obstructs the free outflow of the menstrual blood." The late Karl Schroeder was a most earnest and brilliant advocate of the mechanical theory, and his explanation of the phenomena was the following: "The blood is effused into the uterine cavity, but can escape with difficulty on account of the flexion at the internal os, so that repeated contractions of the muscular tissue of the uterus are necessary in order to force it through the narrowed place. These contractions are perceived as spasmodic pains (uterine colics). They appear at each ensuing menstruation, although their intensity may exhibit differences. Chronic inflammatory conditions are frequently produced by the constantly recurring irritation." Scanzoni combated the mechanical explanation with masterly dialectic skill, and endeavored to show that flexions of the uterus in themselves only attain

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[1] *Loc. cit.*, 3d ed., p. 223.

to more or less significance and are followed by decided disadvantages when associated with other diseases of the uterus and its annexa.

It is, however, undoubtedly the great merit of Schultze to have demonstrated in a scientific and exact manner that the ground on which the mechanical theory is defended is untenable—a certain class of cases excepted, to be mentioned later on—and that the explanation must be sought in the associate metritis. He showed that during the existence of the most intense dysmenorrhœal pains the sound could be repeatedly carried to the fundus without being followed by a drop of blood, and without a drop of blood leaving the uterus for hours—nay, for days— afterward; although, demonstrably, the passage is free, at the time when the pains are at their worst there is no effused blood in the uterine cavity. Moreover, it is a matter of not infrequent observation that an anteflexed uterus, complicated by parametritis posterior, which during the continuance of a metritis shows characteristic dysmenorrhœa, will menstruate without pains after the metritis has been removed, although its form and position have not changed, while the dysmenorrhœa reappears so soon as exacerbation of the metritis has taken place. The same dysmenorrhœa is observed further in a uterus not flexed, the seat of an inflammation either acute or chronic. Again, by analogical reasoning we arrive at the same result from observations made with regard to the anteverted uterus. An anteverted uterus, rigid by reason of the complicating metritis, and fixed in the anteverted position by parametritis posterior, exhibits the most exquisite form of dysmenorrhœa. If the metritis disappears under a judicious mode of treatment, the flexibility of the uterus is restored, and, since the folds of Douglas are shortened by parametritis posterior, a more or less permanent flexion is developed. Notwithstanding the simultaneously appearing and increasing flexion, the dysmenorrhœa disappears in proportion as the flexibility and the flexion increase. Again, the mechanical theory fails to explain the clinical phenomena in dysmenorrhœa, according to Schultze, for the pains begin generally before—sometimes long before—the menstrual flow, and persist with intensity while the flow is scanty, and as soon as the blood becomes more profuse in quantity the pains intermit or cease. But when a mechanical obstacle exists, hindering the escape of the effused blood, which must be overcome by painful, intense contractions, from *a-priori* considerations we would naturally suppose that the more copious the discharge the stronger and more painful must be the contractions to force it through the narrowed place. Consequently, the explanation of the dysmenorrhœa as usually observed in pathological anteflexion is that it should be attributed to the transient flushing of the uterine vessels preceding the menstrual flow. The appearance of a copious discharge of blood relieves the distended vessels and diminishes the contractions and their pains. The mechanical theory, how-

ever, must be invoked to explain the dysmenorrhœa observed in stenosis of the external os or internal os, especially in cases of puerile anteflexion, in which the former is by no means rarely seen, as well as exceeding narrowness of the cervical canal. Stenosis of the internal os is by no means as frequent as has been usually stated. It is a correct clinical observation that pathological anteflexion is often accompanied by *sterility*. It has been usual to attribute the sterility to the flexion : it is more in accordance with clinical facts to assume that it is due to the inflammatory processes associated with the anteflexion. Formerly—and it is not very long since—every anteflexion was considered as pathological, and, as the association was not unusual, the sterility was regarded as due to the anteflexion *per se*. It is, however, more rational to attribute it to the endometritis, oöphoritis, and perimetritis which so often complicate anteflexion, and which hinder conception for reasons not far to find. If these are removed, and if the perimetritis has left behind no permanent pathological changes, conception may ensue notwithstanding the existence of parametric cicatricial tissue or permanent anteflexion.

The DIAGNOSIS of pathological anteflexion cannot be made from the degree of the angle, for this is a matter of indifference, provided the flexibility of the organ is normal or increased ; nor can the diagnosis be made from the symptoms, for they can be produced by other conditions. It must depend alone on the demonstration of the *stability of the flexion*. This demonstration can be elicited by the recognition of the permanence of the angle of flexion as the result of bimanual palpation ; or by the establishment of the fact that the anteflexion persists even when the bladder is distended ; or, *thirdly*, by the discovery that the folds of Douglas are shortened or stiffened. The use of the sound to assist in making the diagnosis can, as a rule, be dispensed with, and only where there are special indications is its use to be recommended. We can obtain all the information necessary for a diagnosis, rare cases excepted, by combined vaginal or rectal and abdominal examination. We can form an idea of the degree of flexibility of the uterus by fixing the portio vaginalis or cervix with one or two fingers of one hand *per vaginam*, while with the other hand the fundus is grasped through the abdominal walls and an effort is made to approximate or extend these parts. At the same time we can ascertain if there is fixation of the organ behind or adhesions in front. The posterior fixation of the cervix in consequence of shortening of one or both of the *retractores* is recognized by the high position of the vaginal portion, by its approximation to the posterior pelvic walls, by its forward direction, and by the diminished or suspended mobility of the uterus. In the *congenital* or *puerile form* of anteflexion, in consequence of the fact that the vaginal portion lies in the axis of the vagina, and especially when there is

posterior fixation, the error can be easily made of mistaking this condition for a retroversion. By rectal exploration we gain information of the condition of the folds of Douglas, their prominence, thickness, narrowness, or painfulness.

TREATMENT.—If the pathogenetic views above enunciated are well grounded, then it must of necessity follow that the object of our therapeutic endeavors in pathological anteflexion should be the removal of the parametritis posterior or perimetritis and the results. It is not intended by this statement to deny the existence of other causes of pathological anteflexion, as a metritis which has made the flexion constant or a superincumbent tumor which hinders the normal excursion of the uterus; but the parametritis and perimetritis are factors in the production of this morbid condition chiefly predominant. I am fully aware of the fact that the pathological significance of parametritis posterior has been called in question, but my clinical observations, carefully conducted with an earnest desire to exclude all sources of error, have convinced me that the doctrines enunciated by Schultze are correct. " It is certainly suspicious," says Fritsch, "to construct diseases for the explanation of facts. Schroeder insists rightly that parametritis posterior is never found nor seen at the autopsy-table." But, as this distinguished writer goes on to remark, " all these objections are not at all fitted to shake the actual correctness of the views of Schultze. For patients do not die of anteflexion, and if death appears, age, intercurrent diseases, or other conditions have so operated that a substratum of parametritis posterior will not be found." I find, as a confirmation of the opinion I expressed, that clinical observers are more and more inclined to recognize the truth of these views, and even Schroeder, who at first opposed Schultze, in successive editions of his work came over more and more to the ground occupied by Schultze. Gynecological pathological anatomy is here far behind clinical investigation, and until it acquires larger proportions it will be an act of becoming modesty for its cultivators to refrain from invocating its authority.

During the continuance of parametritis posterior it is a matter of paramount importance to regulate the bowels in order to protect the retractors from injury, to which they are liable from the passage of large stools, or, on the other hand, from diarrhœa accompanied by straining efforts. To be avoided also is *coitus*, and, again, our efforts must have in view the limitation of abdominal pressure; hence all violent exertion is contraindicated. Just before menstruation, when the uterus is supersensitive, the dysmenorrhœa can be moderated by a suitable abstraction of blood from the portio. Deep scarifications I prefer—because the quantity of blood withdrawn and its effects can be carefully noted—to the application of leeches. Others give the decided

preference to leeches on account of the after-bleeding. If scarifications
are decided upon, they are best made with the patient in Sims' posi-
tion, the portio being exposed by his speculum; the lips of the os are
everted, and one or two incisions are made in its mucous membrane.
It need scarce be insisted upon that strict antiseptic precautions must
be enforced. The vaginal portion and vagina must be, beforehand,
thoroughly cleansed by a solution of carbolic acid or other antiseptic,
and after the proper quantity of blood has been abstracted the incisions
must be irrigated with a 2 or 3 per cent. solution of carbolic acid.
These scarifications are to be repeated every three or four weeks. In
the application of leeches the vagina must be carefully disinfected
beforehand. For the mode of their application the reader who is
interested would do well to consult Mundé's excellent work on *Minor
Surgical Gynecology.* It is especially important to take measures to
prevent the leech from gaining admission into the uterus. If this should
happen, grave symptoms might supervene consisting of uterine colic,
intense hemorrhages, and general convulsive phenomena. Scanzoni and
others have noticed acute eruptions of the skin after their application.
I have observed in one case, after the use of one or two leeches, a most
alarming hemorrhage ensue. Moreover, in some cases, the suction of
the leech produces such an irritation that the opposite effect to that
intended is produced, and there is an increased fluxion of blood to the
uterus.

Since *chlorosis* is so frequently observed in women who have path-
ological anteflexion, it goes without saying that it is all important
to improve the condition of the blood and general nutrition. When
we send such patients to watering-places where there are medicinal
springs, we should always select those waters for the patients to drink
which favor reconstructive metamorphosis. In the same way, the drugs
exhibited should be chosen with that view.

An essential factor in maintaining the parametritis posterior is the
uterine catarrh. When such a catarrh is the result of gonorrhœal
infection its causal relation to the complicating parametritis or peri-
metritis is plain. Schultze, however, maintains that even in the case
of simple catarrh, in consequence of stagnation of the secretion, para-
metritis may be developed. I can confirm the excellent effect of wash-
ing out the uterine cavity with a solution of carbolic acid after a pre-
liminary dilatation with aseptic laminaria tents, followed by steel dila-
tors, as recommended by Schultze, not only in relieving the uterine
catarrh, but also in causing absorption of the parametric exudation.
The cervical canal remains afterward wide enough to allow the free
escape of the secretion; and if there is a return of the catarrh, there
is not so much danger of a recrudescence of the parametritis. If the
parametritis posterior has existed for a comparatively short time, the

uterus may regain its normal position and mobility after the subsidence of all inflammatory symptoms.

In the more chronic forms of this parametritis, after some years the retractores remain shorter than normal, but are extensible, and no pain is complained of on the part of the patient when the uterus is pulled downward toward the vulva. On bimanual palpation we find in these cases of parametric shortening of the retractores, in which all inflammatory symptoms have disappeared, that the cervix is drawn upward and backward—that there is still anteflexion, and there is more or less torsion. Such women may menstruate without pain, and conceive, and hence there is no indication to correct the position of the uterus. In this class of cases now under discussion, in which all inflammatory complications no longer exist, but in which there is dysmenorrhœa complained of or in which sterility is a symptom, the question may be raised as to the desirability of the use of the intra-uterine stem-pessary or not. The subject is a very extensive one, and the reader cannot do better than to consult Mundé's work already referred to for information in regard to the dangers incident to their employment, the precautions to be observed, mode of introduction, etc. For my own part, I am of the decided conviction that the good to be obtained by the use of intra-uterine stem-pessaries is not of so positive a kind as to outweigh the dangers incident to them; and, moreover—and this is the main thing—the same effect can be produced by the employment of dilating sounds in a way entirely devoid of all dangerous consequences. It ought not to be left out of consideration, it may be said in passing, that the patient wearing an intra-uterine pessary is at any moment liable to septic infection, as it is impossible to keep the pessary in an aseptic condition, and it may readily cause slight wounds. The introduction of sounds—steel I prefer—gradually increasing in thickness so as to dilate thoroughly the cervical canal and the internal os, will, when repeated sufficiently often, relieve the dysmenorrhœa, as a rule, and often the sterility. The object is not to straighten the flexion, as is usually taught, for when we have brought the uterus to the condition of anteversion or retroversion we have certainly not produced a normal position. On the contrary, the good effects of the sound are owing to the free escape of the secretions and to the fact that the uterine mucous membrane is altered for the better, so that the catarrh declines.

RETROVERSION AND RETROFLEXION.

DEFINITION.—*Retroversion* may be defined as the permanent dislocation backward of the fundus uteri when the form of the uterus is such that axis of body and axis of cervix are identical. *Retroflexion* denotes the permanent backward dislocation of the fundus uteri, with

simultaneous flexion of the uterus over the posterior surface. As a rare combination we sometimes find *retroversion* with *anteflexion*. Anteversion and retroflexion can also coexist. I agree with Schultze in the opinion he expresses that it would be useful to define retroversions and retroflexions according to different degrees if all authors defined these degrees alike. As this is not the case, the designation according to degrees is not to be commended, but our understanding of the condition is facilitated by mentioning the vertebra to which the

Fig. 353.
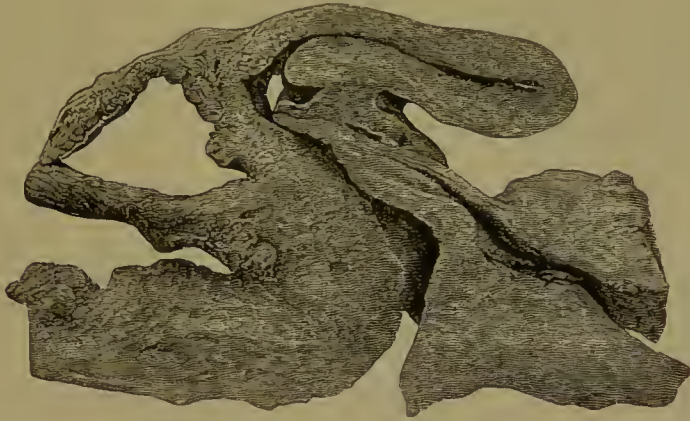
Retroflexion of the Uterus (after Winckel).

fundus corresponds. The backward-lying fundus can correspond to the last lumbar vertebra, to each of the sacral vertebræ, or to the coccyx. The uterus whose axis is horizontal when the woman is standing is very much retroverted or retroflexed, as the case may be.

ETIOLOGY AND ANATOMY.—Retroversion and retroflexion may be studied together, as the retroversion is usually a transitory condition, and the retroflexion originates from it. It must not be understood, however, that every retroflexion has retroversion as the necessary antecedent. The permanent form of retroversion is retained, it must be added, when the uterus is abnormally rigid, consequently when the same conditions obtain as are found in anteversion. Retroversion and retroflexion may coexist. Retroversio-flexio may originate in an acute manner, even in the unimpregnated uterus. Any cause which evokes intensification of the intra-abdominal pressure may give rise to it, such as lifting a heavy object, violent efforts at emesis, a blow on the abdomen, a fall in which the sacrum receives the chief shock of the injury. A necessary condition for the production of a backward displacement of the uterus under these circumstances is a full bladder. From a medico-legal point of view, it is well to bear in mind the possibility of an acute origin of this anomaly from such causes as those just enumerated. Usually, however, the retroversio-flexio is evoked by causes of

a chronic character.   I am convinced, from careful clinical study, that
the opinion which is shared by the preponderating majority of gyne-
cologists that retroflexio is rare in the virgin, and that we must seek
the causes of the origin of nearly all cases of retroflexio in the puer-
peral state, is not correct.   My views are in entire harmony with those
of Küstner[1] when he says: "A much larger quota of retroflexions
which are observed date, not from the puerperal state, but had already
originated before the first pregnancy, and only re-established them-
selves in each instance in the puerperium because the attachments of
the uterus were in the beginning relaxed ; that is, a far greater number
of retroflexions than has been hitherto assumed are affections carried
over into the sexual life from the time of puberty and puerility."   Let
us now, with the aid of the exact and rigidly scientific inductions made
by Schultze, and more lately by Küstner, seek to elicit the factors
potent in the production of this anomaly.

The first cause which invites scrutiny is an arrest of development.
As we saw in studying the subject of anteflexion, the peculiarity of
this defective development consists in an abnormally long portio inter-
media and short vagina, and especially a short anterior vaginal wall.
When the bladder is full, such a uterus must lie in the axis of the
vagina, and instead of a retropositio taking place, as in normal rela-
tions, a retroversio is caused.   If such a uterus loses its flexibility in
consequence of an inflammation or other cause, such a retroversio be-
comes permanent.   In old women a backward displacement is met
with at times, the cause of which is doubtless the short vagina conse-
quent upon senile retrograde metamorphosis.   The most frequent ana-
tomical cause, however, giving rise to retroflexions is a relaxed condi-
tion of the ligaments maintaining the uterus in its normal position,
especially of the utero-sacral ligaments, or, as Luschka calls this mus-
cular apparatus, the musculus retractor uteri.   As we shall see farther
on, a morbid condition of one or the other of the broad ligaments is
also important in bringing about this anomaly.   The anatomist Lusch-
ka[2] described the musculus retractor as follows : " The folds of Doug-
las enclose an organic muscular tissue which, as a roundish flat bundle,
runs in the interior of the free edge beside the rectum up to the neigh-
borhood of the second sacral vertebra.   Into its formation enter not
only a certain sum of fibrous cells of the uterus, but the upper end of
the vagina adds a certain contingent.   The fleshy bundles of the two
sides coalesce in these places to a girdle concave toward the rectum,
which appears externally as that elevation which unites the anterior
ends of the folds of Douglas. . . . . If we fix our attention upon this
entire arrangement in regard to its functional significance, it can scarce-
ly appear doubtful that it is fitted to determine and secure the normal

[1] *Loc. cit.,* p. 84.   [2] *Die Anatomie des Mensch. Beckens,* p. 360.

position of the lower end of the uterus, in conformity with which it
might be suitably called musculus retractor uteri." Luschka regarded
the whole apparatus as constituting one muscle, but writers generally
regard it as composed of two muscles. We have followed the general
usage in speaking of them as *retractores*. Küstner[1] has subjected the
folds of Douglas to careful microscopic investigation, and insists that
they contain extraordinarily weak and few bundles of smooth muscular
fibres. "But," he continues, "if we go about 1 cm. laterally from the
free edge of Douglas' fold, we meet with dense bundles of muscular
parts that are readily perceptible to the naked eye. The arrangement
is in the form of a flat bundle running along beneath the peritoneal
investment. If we were to estimate the power in its totality, we
should say it attained to almost the strength of the ligamentum rotun-
dum uteri. *Before*, this muscular apparatus goes over into the muscu-
lar tissue of the uterus and the vagina; behind, into the rectum and
past the rectum up to the periosteum of the sacrum." For the prac-
tical gynecologist it is sufficient to know of the existence of this mus-
cular apparatus and its important functions, and whether it is in the
folds of Douglas or just outside may be left to further anatomical
study and investigation. "The loss of the posterior fixation," says
Schultze,[2] "is quite particularly the cause of the backward displace-
ment of the fundus uteri. If the action of the retractores and the
elastic elements of the folds of Douglas is wanting after copious evac-
uation of the rectum, the vaginal portion remains standing forward.
The next filling of the bladder presses the corpus uteri backward.
Each new filling of the rectum and of the bladder adds its effect to
the preceding, and thus after the evacuation of the bladder or rectum
once or several times a position of the uterus appears in which the
intra-abdominal pressure of the abdominal contents affects the anterior
surface of the corpus uteri more decidedly than the posterior. The
fundus is forced into the hollow of the sacrum."

A potent factor in the production of a weakened and relaxed condi-
tion of the retractores is, according to Schultze, parametritis posterior.
Dr. Emmet, as previously mentioned, has called frequent attention to
the existence of this form of parametritis, and finds in its effects an
explanation of many bladder symptoms. This parametritis, as we saw,
may occur during the puerperal condition or it may affect the nullip-
arous woman or the virgin. It is not necessary to stop here to discuss
the question whether this form of inflammation is a parametritis or a
perimetritis. I, for my part, believe it to be parametritis; but, be this
as it may, this much is certain, that as a result of this parametritis—or
perimetritis, if you will—in a certain class of cases, after the absorp-
tion of the exudation the retractores lose their elasticity and contrac-

[1] *Loc. cit.*, p. 61.   [2] *Loc. cit.*, p. 132.

tility and become atrophic and relaxed; the uterus loses the posterior fixation of its cervix; the vaginal portion drops forward; and the first time the bladder becomes filled and the intra-abdominal pressure is called into action the uterine body is thrown into the hollow of the sacrum. It is only necessary to refer for a moment, in passing, to the effects of a parametritis anterior in producing an anterior fixation and subsequent retroflexion, and to the effects of cicatricial contraction after great loss of substance consequent upon vesico-vaginal fistulæ, in producing a like result. A limited category of anatomical causes, eventuating in the origin of retroflexion with a rigid angle, depends on the differences in the nutrition of the anterior and posterior wall. E. Martin considered that defective retrograde metamorphosis played a conspicuous part in the causation of retroflexion when the placental site was situated on the anterior wall.

No exposition of the etiology of retroversio-flexio can lay any claims to completeness without reference to the influence of the puerperal state in the production of this morbid condition. During the puerperal state two predisposing factors come into play which render it comparatively easy for dislocating forces to unfold their efficacy. All the pelvic organs are in a condition of relaxation, and the uterus is enlarged and swollen; if, therefore, the patient lies persistently on her back, and the bladder is allowed to become distended, and if the rectum, in addition, is allowed to be permanently filled, it must follow as an almost necessary consequence that the fundus uteri is forced backward on the one hand, and the cervix is anteposed on the other; the retractores are hindered in their involution, and retroversio-flexio is the result.

Another and very frequent cause of retroflexion is laceration of the cervix. Dr. Nathan Bozeman of this city has studied the subject of retroversion in relation to lacerations of the cervix in a paper read before the American Gynecological Society in 1878. He remarks that "laceration of the cervix may contribute to the acquired or morbid forces"—dislocating forces I understand him to mean—"but, independent of endometritis and subinvolution, so slight and unimportant an injury can hardly be expected to lead to such serious derangement of the counteracting forces." How irrelevant this conclusion is I shall immediately proceed to show. In the study of the mechanism of posterior displacement from this cause I shall avail myself of the excellent monograph of Küstner previously referred to, as I believe his explanations are correct, and my clinical observations are confirmatory of them in all essential points. With the great frequency of laceration of the cervix as a consequence of childbirth on one or both sides all gynecologists are familiar. If the laceration affects both sides of the cervix, that of one side is generally deeper than that of the other. When the laceration is deep—and it may extend into the parametrium

of the corresponding side—inflammatory processes are set up which soon, however, as a rule, end in cicatricial contraction. The vaginal portion is drawn over to the affected side in consequence of this cicatricial shrinkage. These cicatricial bands or cords, running off laterally from the lacerated cervix, are often met with. What are the consequences, now, of this cicatricial contraction? The two broad ligaments are no more capable of performing their normal functions in a proper manner, the one on account of immoderate traction, the other on account of passive relaxation; the uterus goes over more sluggishly into its normal condition of anteflexion after each evacuation of the bladder and rectum than it would were it not laterally fixed. However, this is not all. From the fact that the uterus is fixed on one side the movements which it makes when the bladder is full do not occur as a movement *in toto* behind (retropositio), but as a movement of the fundus backward, the portio remaining unmoved. This movement, which even in excessive fulness of the bladder would place the uterus with its longitudinal axis scarcely behind the pelvic axis, is exceedingly hazardous, because the portio remains standing relatively forward. A circumstance, however, which especially operates unfavorably against the maintenance of the normal position is the fact that under the conditions just mentioned the rotation takes place, not about an axis which goes transversely through the middle of the cervix, but about an axis which cuts the uterus obliquely, and, in fact, quite unsymmetrically—about an axis which is nearer to the longitudinal than to the transverse axis. In this oblique position the uterus needs but a slight excursion to pass from its normal position into retroversion. A moderate degree of fulness of the bladder, a rather long continuance on the back in the recumbent posture, carry the fundus over to a point from which the intra-abdominal pressure can throw it into retroversio-flexio. This theory, Küstner thinks, finds its confirmation in the circumstance that lateral fixation of the cervix is so frequent, every gynecologist of extensive practice having almost daily opportunity of observing it. Finally, my experience is in exact accordance with that of Küstner when he says that in making an endeavor to replace such a retroflexed uterus by bimanual manipulation, if there is the slightest asymmetry in the position of the portio the uterus is much more easily replaced by making it assume a more or less transverse position, the portio remaining where it is fixed and the fundus on the opposite side, and rotating it about its longitudinal axis. The fact, now, that in restoring such a retroflexed uterus to its normal position the rotation around the longitudinal axis takes place more readily than around the transverse axis speaks in favor of the view that the reverse rotation—that is, that from before backward—occurs more readily too around the longitudinal axis than around the transverse axis. It is

obvious, therefore, that lateral fixations, which compel the uterus to execute its physiological movements or rotations around the longitudinal axis, predispose it in a great degree to retroflexio.

Symptoms.—The symptoms of acute retroversion are rectal tenesmus, symptoms of metritis and peritonitis, and urinary disturbances: the symptoms may further be complicated by the injury which caused the retroversion. The symptoms of chronic retroversio-flexio are so multiform that they embrace the entire gamut of morbid sensations. Besides the symptoms derived from disturbance of the genital functions and those of the neighboring organs, various nervous and hysterical phenomena are called into existence, while remote organs, apparently standing in no sort of connection with the uterus, manifest functional disorder. Hence the most varied alienations of the psychical sphere, the strangest forms of anæsthesia and hyperæsthesia of particular portions of the body, the most persistent forms of neuralgia, and, finally, phenomena of spasm and paresis involving numerous groups of muscles, may be dependent entirely upon retroversio-flexio, and can be partially or completely relieved only by a restoration of the uterus to its normal position. From what has been said it will not excite surprise to affirm that in a certain class of cases the uterus may be retroflexed if it is otherwise normal, and yet manifest no morbid phenomena. Therefore some gynecologists have drawn the illogical conclusion that it is not the change of the position in itself that evokes the morbid train of symptoms, but the inflammatory conditions which complicate it. Leaving out of view the important circumstance that retroversio-flexio is especially liable to inflammatory conditions which frequently extend to the neighboring peritoneum, clinical observation shows conclusively that the abnormal position alone produces symptoms injuriously affecting the health of the patient. Pains in the back, hardly ever missed, are usually referred to the region of the sacrum: these are almost always relieved or moderated by a restoration of the uterus to its normal position. They are intensified by the association of a catarrhal inflammation of the uterus. Often, simply and solely on account of the abnormal position of the uterus, the circulation is unfavorably affected in this organ, and venous stasis is a necessary consequence. This will be manifested by a sensation of fulness and weight in the pelvis, a "bearing-down" feeling as if some foreign body were to be expelled, while the pains in the back are increased. The mucous membrane will naturally participate in the irritation which affects the whole organ, and consequently the symptoms of chronic endometritis catarrhalis will be manifested. In consequence of the blood-stasis and the proliferation of the mucous membrane, menstruation becomes profuse. Exceptionally we may find amenorrhœa as a transient symptom, or menstruation may be scanty. The rule, however, is that menstrua-

tion is more profuse, lasts longer, and recurs at shorter intervals than is normal.

And here we have a striking proof of the proposition affirmed, that it is the abnormal position which is productive of the major part of the morbid phenomena; for if the retroflexed uterus, in which this symptom has continued for years even, is restored to a correct position, the menstruation will assume a normal type. After the retroflexion has existed for many years the menorrhagia may cease and menstruation become scanty, partly in consequence of the general anæmia, partly in consequence of the atrophy of the mucous membrane the result of the chronic endometritis. In another class of cases, notwithstanding the increase of the anæmia, menorrhagia persists and becomes worse by degrees, and the menopause is delayed far beyond its usual time of appearance. I have had repeated opportunity of observing the premature recurrence of menstruation in consequence of retroflexion in women who are nursing. When there are evident signs of chronic catarrh, as is usual, the menstruation will generally be accompanied by more or less dysmenorrhœa. Fritsch observes that in multiparæ the blood escapes so easily from the vessels of the mucosa, and flows out of the wide uterine cavity with such little difficulty, that dysmenorrhœa does not exist. This is not my experience. In nulliparæ the dysmenorrhœa is, to be sure, much more intense than in parous women, but even in the latter it is very usual to observe pains in the lower part of the back, in the hypogastrium, in the inguinal regions, besides uterine colics. With reference to sterility, it may be affirmed that at first retroflexion does not hinder conception in the case of parous women. But, on the other hand, they are very liable to abort, and the results of therapeutical measures show that this result is directly due to the abnormal position, for if the uterus be restored to a proper position, and maintained there, pregnancy will not be interrupted, as I have repeatedly demonstrated clinically. After retroflexion has existed a long time, however, such women become sterile on account of the general anæmia, the uterine catarrh, or the oöphoritis or perimetritis which very likely complicates it. In the case of nulliparæ sterility is a very frequent accompaniment of retroflexion, as we are more apt to find here complicating perimetritis or its remains.

Painful defecation is a frequent symptom of retroflexion. The relaxed *retractores*, although the body of the uterus lies between them, offer no obstacle to the passage of the fecal matter, but the retroflexed uterus is so liable to hyperæmia, increase of volume, and peritoneal irritation from causes not usually provocative of these conditions that it need cause no surprise that the evacuation of the loaded rectum is often followed by tenesmus or other disagreeable sensations in the pelvis. Constipation is often met with in retroflexions: this is not due,

as might at first thought be supposed, to the encroachment on the rectum by the uterus; it is rather due to the sluggishness of the intestinal canal from paresis of the muscular tissue; and this overloading of the intestines with fecal matter doubtless contributes to increase the annoyances of which the patient complains by the injury inflicted upon the fundus by its passage through the rectum.

Urinary disturbances are not so frequently complained of as in anteflexion, but frequent micturition sometimes forms a most disagreeable symptom. Retention of the urine is only observed when the uterus has attained the volume belonging to it in the fourth month of pregnancy. In consequence of their dislocation backward the ovaries are the cause of manifold painful sensations in retroflexions. They are congested, and often exquisitely sensitive on pressure. They are often found in Douglas' pouch or in close proximity, so that in each evacuation of the rectum they are exposed to injury. Schultze expresses the opinion that the existence of retroflexio is favorable to the origin of ovarian tumors. Hildebrandt[1] communicates a number of cases in which, in consequence of flexion of the ureters, there was an obstruction to the passage of the urinary secretion. This is a rare phenomenon. Nephritis in women suffering with retroflexion is a more frequent occurrence. Not infrequently we meet with phenomena of paresis, usually involving groups of muscles of the lower extremities, but sometimes extending to muscles elsewhere situated. The explanation is different according to the case. Sometimes this affection is due to direct pressure of the enlarged uterus on the motory nerves of the inferior extremity; at other times it may be traced to inflammatory processes in the pelvic connective tissue; and, again, we must assume that it is a reflex phenomenon. In one case to which Hildebrandt refers, and which he treated in association with Leyden, it was the opinion of the latter that the painful paresis of the left leg was caused by neuritis: in this opinion Hildebrandt coincided. Such a neuritis of local origin, according to Leyden, may lead to myelitis. At times we are able to demonstrate that the disturbances of innervation are due to pressure of the retroflexed uterus by the rapid disappearance of the symptoms on rectifying the position of this organ. Many and varied forms of other neuroses are produced by retroflexion, and can only be successfully treated by having regard to their cause. Schroeder[2] describes a case of chorea which was temporarily relieved by the temporary removal of the flexion, and entirely disappeared after the permanent restoration of the retroflexed uterus to its normal position. Chrobak[3] publishes a case of a severe form of neuroses affecting respiration which was at once arrested by the reposition of the uterus.

[1] " Ueber Retroflex. des Uterus," *Samml. kl. Vorträge*, No. 5, p. 33.
[2] *Berlin. klin. Wochenschrift*, 187, No. 1.   [3] *Wiener med. Presse*, 1869, No. 2.

Not long since a patient came under my care who had facial neuralgia, gastric disturbances, and depreciation of the nutrition of the body generally, her whole appearance being that of a woman in declining health. As I could find no explanation for these symptoms from the condition of the other organs, I instituted an examination of the pelvis, and found a retroflexed uterus, though there had been no symptoms whatever referable to the pelvis. Proper orthopædic treatment was followed by the most gratifying results, the patient being restored to excellent health in a comparatively short time. In the psychical sphere, leaving out of view the long train of hysterical manifestations, two deficiencies are especially dwelt on by the patient in the narration of her "Iliad of woes:" first, failure of the memory, and, secondly, incapacity for prolonged mental effort.

DIAGNOSIS.—*Retroversion* can be diagnosed, as a rule, by examination *per vaginam* through the peculiar direction of the vaginal portion, which lies forward in the pelvis, and through the demonstration of the backward position of the supravaginal portion of the cervix and body ; and this the relaxed condition of the fornix permits without difficulty ordinarily. By bimanual palpation we notice the absence of the fundus in front, only vaginal and abdominal walls intervening between the two hands.

Retroflexion may be generally recognized without difficulty. On examination *per vaginam* the portio will be found low down in the pelvis, often close to the vulva or approximated to the symphysis, while in the posterior fornix and continuous with the cervix, but separated from it by a groove of greater or less depth, will be found the body, whose form is characteristic. The connection of the body with the cervix, and its flexion on it, can usually be perceived with almost absolute certainty. From the rectum the body can be still more plainly recognized. Errors from this examination are by no means excluded, however, for tumors behind the uterus can very closely simulate the uterine body ; as, for example, myomata attached to the posterior wall, exudates in Douglas' pouch, and the enlarged ovary or small ovarian tumor, all of which may be attached to the cervix. When there is any doubt, bimanual palpation must be called into requisition. The hand manipulating through the abdominal walls perceives that the cervix is not directly continued into the body ; in order to that the whole organ must be anteposed : on the contrary, it feels the place where the flexion exists, and farther behind it finds the surface of the flexed body, which was previously anterior, and by the co-operation of the hand exploring the vagina it establishes the fact that the tumor which is between the opposite fingers is nothing else than the uterine body. In this way the form, size, mobility, and sensitiveness of the organ can be fully appreciated. In regard to adhe-

sions impairing mobility or preventing it, we shall postpone discussion until we come to speak of treatment. The rectal examination is especially valuable when the abdominal walls are rigid, as by drawing the uterus down with a tenaculum or volsella the fundus can be readily reached *per rectum.*

With reference to the differential diagnosis between retroflexion and tumors lying behind the uterus, it is only necessary to call attention to the fact that bimanual palpation will always show us the existence of the body in front of the tumor, and the exact relation of the fundus to the tumor can often be ascertained by drawing down the uterus with the volsella. The use of the sound to confirm the diagnosis or to make a differential diagnosis is rarely necessary.

TREATMENT.—*Retroversio-flexio* is always pathological. The indications in the way of treatment are—*first,* to adopt such prophylactic measures as will prevent the occurrence of retro-deviations, if this be possible; *secondly,* to restore the organ already displaced to its normal position; and, *thirdly,* when thus replaced to maintain it *in situ. Prophylaxis* is usually left out of the question by systematic writers, a notable exception, however, being Winckel; but I am convinced that much may be here accomplished. As said before, my clinical experience fully demonstrates the fact that backward displacements, especially retroflexions, are quite common in young girls and unmarried women. Hence it is the important duty devolving upon the family physician to watch the first appearance of menstruation; and this he can now-a-days often do, as careful mothers frequently consult him on this subject. All anomalies of menstruation should be appropriately treated. During the first days all mental and corporeal exertion should be strictly interdicted, and especially should young girls be prohibited from dancing or playing upon the piano during menstruation. The proper evacuation of rectum and bladder, it need scarcely be said, is a matter of pre-eminent importance.

As so many of the cases of this anomaly date their origin from the puerperal period, either after abortions or after labor at term, *prophylaxis* is especially here in place. We must therefore be careful to see to it that the bladder is emptied at proper times, and not allowed to become distended, that the rectum is not overloaded, and that the patient be cautioned against lying too long on her back. As the *retractores* partake of the subinvolution of the uterus, whenever we find any evidences of the existence of this condition in the latter we may safely assume that the former are involved, and must adapt our measures accordingly; hence ergot will be frequently indicated to bring about involution in the whole. When symptoms of already existing retroversio-flexio are present, the sooner the displaced organ is restored to its normal position the better the prospect of a speedy and permanent cure.

It is not to be denied that at times we meet cases of retroversio-flexio in which there are neither subjective annoyances nor anatomical changes united with the anomalous position which can be objectively demonstrated; the organism seems to have gradually accommodated itself to the abnormal condition of things. This is not so infrequently found in women who have passed the menopause. Here it might be proper to abandon any attempt at rectification of the flexion. The first question which ordinarily confronts us and demands solution is this : Can the uterus be replaced, or is it fixed in its abnormal position by perimetric adhesions? The decision of this question is not so easy : the enlarged uterus may be caught between the folds of Douglas as it lies in its abnormal position, and in consequence of the incarceration there may be an augmentation of the congestion, so that every attempt at reposition evokes such severe pain that we must desist from the effort. But even when not caught between these folds the enlarged and inflamed uterus may still be so sensitive when lifted from its anomalous situation as to contraindicate attempts at orthopædic treatment. Under these circumstances a judicious preliminary treatment is indicated. Rest in bed, the copious use of vaginal douches of hot water, the wet pack at night to the lower part of the abdomen, sitz-baths made stimulating by sea-salt, scarification of the vaginal portion, or the vaginal pack as recommended by Engelmann[1] and Emmet,[2] will be followed by such an improvement in the inflammatory symptoms that the repeated attempt at reposition will either be crowned with success or we will be convinced of the existence of perimetric adhesions. In some rare cases it will be necessary to resort to the use of chloroform, even when there are no adhesions, especially when we have to deal with a highly neurotic patient.

We may enumerate three methods of replacing the retroflexed or retroverted uterus : 1. Bimanual vagino-abdominal and recto-abdominal manipulation. 2. With sound or with Sims' or Emmet's repositor. 3. By genu-pectoral posture, combined with traction on the uterus by tenaculum or volsella, and pressure on the fundus from the rectum.

(1) When it is decided to replace the uterus by the bimanual method, we direct the patient to lie on her back : the fore and middle fingers, usually of the left hand, are introduced into the vagina. It may possibly be now ascertained that the fingers do not reach high enough : it will be necessary then to manipulate from the rectum. Chloroform will here, probably, be required, and at the same time the patient must be placed in the lithotomy position and brought down to the edge of the table or bed on which she is lying, in order that the hand may have free play. Hart and Barbour recommend that the replacement be made with the

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[1] *New York Obst. Journal.*

[2] Paper read before Woman's Hospital Alumni Association.

index finger in the vagina and the middle finger in the rectum. The method recommended by Schultze is much the more effective, and is the one I adopt in practice, and shall here describe. Supposing that we make the attempt to lift the uterus up from the vagina, it will be necessary to place the two fingers lying in the vagina on the body as near to the fundus as we can possibly reach by depressing the perineum. With slow and steady pressure, gradually increasing in power, the body is pushed up along the sacrum past the promontory to the superior strait. The uterus may possibly not lie in the median plane, but deviate to one side or the other: this will very probably be the case if the retroversio-flexio is complicated by laceration of the cervix. In that case we may find, as indicated before, that elevation will be effected more easily by rotating the organ around its longitudinal axis. If it lies more or less in the median plane, it will be judicious to try its lateral mobility with one finger on one side and the other finger on the opposite, and then to push it up from the side which offers the least resistance. As a rule, the efforts at reposition are attended with a good deal of pain. If the diagnosis is certain, we should not desist from these efforts unless the resistance opposing them is so great as to prove the existence of adhesions, or, at any rate, to make their existence very probable, or, on the other hand, the pain we inflict is obviously too great for the patient's welfare. Under these circumstances further attempts must be postponed until the nature of the obstacles can be ascertained when the patient is under an anæsthetic.

Assuming that we have been able to elevate the fundus to the plane of the superior strait, it devolves on the hand manipulating through the abdominal walls to seize the mounting-up organ and bring it forward. In order to do this the hand operating through the abdominal coverings must get behind the fundus, so as to act on its posterior face. This is sometimes a very difficult manœuvre: the vagina may not be long enough to enable us to lift the fundus to the requisite height, or if we operate from the rectum the finger may not be sufficiently long, or the subcutaneous fat in the abdominal walls may be too thick, or the walls may be too rigid, to enable us to accomplish it. In these circumstances we will be much assisted if we press on the anterior aspect of the vaginal portion, or, if possible, on the supravaginal part of the cervix, the pressure being directed toward the hollow of the sacrum. I have found it exceedingly advantageous to exert pressure on the vaginal portion with the fore finger while the middle finger continues simultaneously to urge the fundus upward. If these two fingers, however, have to be introduced into the rectum to elevate the fundus, the thumb can be inserted into the vagina and pressure exerted by it on the vaginal portion. As soon as the fingers of the hand, manipulating from the outside, have succeeded in getting behind the fundus, the

middle or fore finger of the other hand, in the vagina, pushes the vaginal portion backward, so that the uterus now occupies the normal position.

Another manœuvre can be practised with success at times, and should be kept in mind. It is thus described by Emmet:[1] " For employing this method the patient is placed on her back, with the knees flexed and the hips drawn down to the edge of the operating-table or chair. Introduce then the index finger into the vagina, and direct the point of the tenaculum so that it may be hooked into the posterior lip just within the os. The instrument is to be used for the purpose of gently drawing forward the organ sufficiently toward the vaginal outlet, until we are satisfied that the fundus is distant enough from the hollow of the sacrum to pass the promontory when elevated. At the first attempt this manipulation must be done with care, and if a point is reached at which great pain is produced we must desist. By this manœuvre the uterus of course becomes more retroverted than before. To correct this the perineum should be pressed firmly back, that the finger in the vagina may be passed up as far behind the uterus as possible, and made at the same time to lift the organ. When the fundus of the uterus has been thus elevated, and while it is being held up by the finger, the cervix is to be suddenly carried in the arc of a circle downward and backward by means of the tenaculum, which has been hooked in the anterior lip and is held in the other hand. . . . . The finger must be quickly passed from the posterior cul-de-sac against the anterior lip, the tenaculum withdrawn, and the organ thrown forward by passing the finger repeatedly down the anterior face of the uterus, so as to press the cervix downward and backward into the hollow of the sacrum." Instead of the tenaculum, I prefer to use the volsella, as recommended by Hart and Barbour, Schroeder, Küstner, and others, for the reason that the tenaculum is apt to pull out, and at the same time wound the tissue. The guiding finger, too, of the gynecologist may be caught by the point of the tenaculum under the conditions just mentioned.

(2) Replacement by the sound can be very advantageously employed as a substitute for bimanual manipulation, under certain circumstances ; as, for example, when the latter procedure causes a great deal of pain, when the abdominal walls are thick and unyielding, and the use of an anæsthetic is contraindicated or inconvenient. If the use of the sound is guided by antiseptic principles, and if due care and dexterity are brought into requisition, neither pain nor danger is to be anticipated. Dr. Sims invented a very ingenious instrument for replacing the uterus, to which he gave the name " elevator." As he himself remarks, it is nothing but Simpson's sound with a joint two inches from the end.

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[1] *Loc. cit.*, p. 299.

Emmet modified this instrument by dividing the uterine portion into segments movable from the straight position only in one direction. These instruments are both useful, and Emmet's especially has proved valuable in my hands in many cases. Inasmuch, however, as retroversio-flexio is a very common affection, and consequently must come under the care chiefly of the general practitioner, it is a matter of exceedingly great importance to simplify our methods of reposition, and dispense, as far as possible, with instruments which only a specialist will be likely to have in his armamentarium; and hence the sound must generally be employed. We must be very careful not to employ too much force, and, as the sound gives us great leverage, this blunder may be easily committed. The curve of the sound must be made to conform to the degree of retroflexion, and must be introduced with the concavity directed backward instead of forward. The sound is now so rotated that the intra-uterine portion retains an unaltered position, except a rotation on its longitudinal axis, while the handle moves laterally in a wide sweep, describing the arc of a circle in a direction from behind forward. The handle of the sound is hereupon slowly and gently depressed toward the perineum, and thus, as its concavity is now directed forward, it gradually replaces the uterus. In practising this manœuvre we can feel whether the uterus is free, or if it lies incarcerated in Douglas' pouch, or if it is fixed by perimetric adhesions. Before withdrawing the sound it will be well to ascertain by external palpation if the uterus is lying in its normal position of anteflexion.

(3) The genu-pectoral method of replacing the retroflexed uterus, though known before, was first systematized as a method by Dr. H. F. Campbell. As Thomas[1] remarks: "Campbell's method never does harm, generally effects great good as an adjuvant to other treatment, and in rare cases proves in itself sufficient for complete relief." When the patient is made to assume this posture the abdominal contents gravitate downward and forward; unless the abdominal walls are unusually rigid or there is an unusual fulness of the abdominal cavity, there is a decided lowering of the intra-abdominal pressure, so that it sinks below the atmospheric. If the vaginal introitus is not very narrow or is artificially opened, the vagina becomes distended with air. Campbell devised a glass tube, open at both ends, slightly bent, which the patient inserts herself on assuming the genu-pectoral posture, in order to admit air into the vagina. I agree entirely with Hart and Barbour in their statement that the retroflexed uterus does not become replaced, as Campbell supposed. "It moves as a whole," they remark, "near the sacrum, and if already retroverted it becomes still more so. To effect replacement we must either push the fundus forward or draw the cer-

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[1] *Loc. cit.,* p. 440.

vix backward. It is best to combine these actions: having laid hold of the cervix with the volsella *per vaginam*, we draw it downward, while with the index finger of the right hand, *per rectum*, we press the fundus toward the bladder. This method will scarcely be required except to replace the retroflexed gravid uterus."

Before proceeding to discuss the methods of retaining the uterus after its replacement, it will be proper to dwell at some length here on the means at our command for separating the adhesions that fix the uterus. And, in the first place, I shall describe the method of forcible reposition advocated by Schultze. It is important that the stomach, intestines, and bladder are, as far as practicable, in an empty state before the patient is brought under the influence of a narcotic. She is then placed in the lithotomy position and brought down to the edge of the operating-table. An assistant on either side fixes the corresponding thigh in moderate flexion and abduction, while a third gives his undivided attention to the administration of the anæsthetic. The operator, standing before the patient, introduces the index and middle fingers of the left hand high up in the rectum. If there are any fecal masses in the rectum, they are washed out by a stream of hot water, while the fingers in the rectum keep it open. Even if no contents are found in the rectum, this irrigation is advantageous, because the fingers can ascend higher in the dilated rectum. Without this irrigation it is often difficult for the fingers to find their way from the ampulla recti into the narrower part situated above the folds of Douglas, and yet it is very important that the fingers reach beyond this isthmus. If the fingers have passed the narrower portion—or, when very narrow, when one has passed—the operator supports the left elbow on the left knee, for which purpose he places his left foot on a chair standing beside him. The assistance he obtains in this way is very great: there is, further, no expenditure of force on the part of the arm necessary to push up the uterus: the entire attention is concentrated on, and the entire force to be applied is limited to, the dextrous movement of the fingers lying high up in the rectum. After accurate examination of the body of the uterus and the ovaries by palpation— and here the thumb can effectively co-operate from the vagina—the fundus is gradually elevated. Simultaneously the right hand, manipulating through the abdominal coverings, embraces the fundus and endeavors to bring it forward. In this passive movement of the uterus the adhesions are made tense according to their extensibility or length. The extent, origin, and course of the adhesions are accurately ascertained by this examination. Membraniform adhesions are separated by the points of the fingers, as the adherent placenta is detached from the wall of the uterus; isolated cords are caught by the finger in the rectum and slowly broken with a firm hand while the fundus is fixed. Mem-

braniform adhesions of the uterus to the rectal wall offer no serious ob-
stacles to momentary replacement, because the rectal wall follows the
uterus; but when the rectum contracts the uterus is drawn back to its
old position. A similar state of things exists in the case of cicatricial
shrinkings of the peritoneum, because they are displaceable upon the
subjacent tissue even when not extensible. Adhesions of tube or ovary
to the posterior pelvic wall demand quite special caution. In these
circumstances only a slowly-increased pressure should be applied, and
if it does not succeed in releasing the uterus in the first sitting, the
attempt must be renewed in eight or ten days, provided no reaction
followed the first trial. Schultze has suggested another procedure,
which he terms "intra-uterine reposition," for especially difficult cases.
It consists in this, that the palpating finger, instead of operating from
the fornix vaginæ or rectum, acts from the fundus within the uterus,
which has previously been dilated with that view. Two fingers are
introduced into the vagina, one of them into the retroflexed uterus up
to the fundus. The finger straightens the uterus, then is rotated with
the palmar surface toward the anterior uterine wall, and now bent
toward the abdominal wall. The firmness and direction of the fix-
ation are in this way ascertained, and the force requisite for overcoming
it can be judged with some certainty. When the abdominal coverings
contain an inordinate quantity of fat, or when the uterus is very firmly
fixed, it will be advisable to palpate from the rectum and inner surface
of the uterus simultaneously. If the vaginal portion is fixed by a vol-
sella and given to an assistant to hold, very accurate bimanual palpa-
tion may be made by two fingers of one hand in the rectum and one
finger of the other hand in the uterine cavity. If peritoneal adhesions
have been separated in replacing the uterus, several days' rest in bed is
imperatively demanded, and Schultze, as an additional measure of pre-
caution, recommends that an ice-bag be laid upon the abdomen for the
first twenty-four hours. Obstacles to replacement which are not on the
peritoneal surface, but have their seat in the subjacent tissue, perito-
neal contractures and indurations, parametric cicatrices, contraindicate
forced orthopædie measures. For my own part, while willing to admit
that the procedure advocated by Schultze will be attended by no disas-
trous consequences in the preponderating majority of cases if proper
care be used, I have never felt called upon to put it in practice, for the
reason that slower methods have led to the same result with fewer
attendant dangers.

Before proceeding to describe the means at our command for pro-
ducing absorption of the adhesions, it may be said in general terms
that the prospect is better when the sensitiveness of the uterus is
slight, and that even quite extensive exudations can be absorbed in
time and the uterus become movable. My experience has proved con-

clusively that the opinion expressed by Schroeder is entirely correct, that the most effective of all means to free the uterus from its adhesions is *gravidity.* The fear has been expressed that when conception has taken place an abortion will be the consequence; which, though occasionally happening, is by no means the rule. In order to bring about an attenuation, and finally a detachment, of the adhesions, it is first of all important to facilitate the relative movements of the organs situated in the pelvis. The peristaltic movements of the intestine are therefore stimulated by copious enemata of warm water thrown into the rectum; these are continued for a considerable length of time. The circulation in the pelvis is favorably affected and absorption promoted by sitz-baths, made more stimulating by sea-salt: the water should be warm. Hot-water vaginal douches, it need scarcely be said, are of incalculable benefit. The wet pack to the hypogastrium, kept on all night, has in my hands been attended by such gratifying results in relieving pain and stimulating absorption that I am astonished that it is employed so infrequently by gynæcologists. The methods of Engelmann of St. Louis and Emmet, to which reference has already been made, deserve trial to bring about absorption of remains of perimetric and parametric inflammatory exudations by the use of the vaginal tamponade. Engelmann makes his tampons of antiseptic sheep's wool and soaks them in astringent solutions.

In *massage* according to Brandt's method we have a means, when applied to the pelvic contents, of such potency as to leave little to be desired. By cautious manipulations and gradually-increasing application of force we attempt to dislocate the uterus and bring it forward; and we can often, in a comparatively short time, loosen and detach even quite firm adhesions. It requires a good deal of practice, it may be said, to determine the amount of effort we must put forth in these attempts; it is better, in the beginning, to err always on the side of safety and do too little rather than too much. The manipulations of the operator should never be so powerful as to elicit from the patient a cry of pain. It must be borne in mind that we may confidently expect advantage, and never harm, from the employment of massage if all inflammatory phenomena have disappeared. A preparatory treatment of irrigation of the vagina with hot water will have the tendency to make the adhesions softer and more yielding. If the slightest reaction follows this treatment it must be interrupted for a short time. In employing massage the active intervention of both hands in co-operation is demanded. The hand on the outside partly controls and partly aids the fingers in the vagina. As a rule, we should not have recourse to a pessary until the fundus is well brought forward, but occasionally, when the uterus is elevated to about the promontory, the pessary may be applied.

The question now confronts us as to what is the best means at our disposal *to retain the replaced uterus in its normal position.* In the very great majority of cases this may be accomplished with absolute certainty by vaginal pessaries. The best forms are the Hodge pessary and its modifications by Emmet and Thomas. The Albert Smith pessary is also very useful, but as usually sold in the shops the posterior bar is curved so sharply as to press on the posterior face of the vaginal portion, and hence is liable to cut in or produce an erosion. I have generally been compelled to remodel it. The name given by Hodge to his pessary, the "lever pessary," was founded on a misapprehension of the mechanism of its action. He remarks in his book on the *Diseases peculiar to Women,* "It operates as a lever in elevating the fundus from its malposition against the sacrum to its normal position behind the bladder; that portion of the pessary which is posterior to the neck of the organ being the 'short arm,' while all anterior to the neck is the 'long arm,' and the 'fulcrum' or support is the posterior surface of the vagina. As the long arm or horn is depressed by the finger of the practitioner, the short arm rises and carries with it the body and fundus of the uterus." He is speaking here of his horseshoe or open-lever pessary, but, as he observes, the closed lever acts on the same principle. The object sought to be attained by the pessary, however, is to compel the vaginal portion to remain permanently in a position near the posterior pelvic wall, or, in other words, to fix it behind; and this is accomplished by the action of the posterior bar, which pushes the posterior fornix vaginæ upward and backward, and thus by its traction tends to keep the cervix behind. As the cervix cannot deviate forward, the uterus must be maintained in a permanent position of anteflexion, the intra-abdominal pressure acting on the posterior surface of the uterus under these conditions. In the proper adjustment of a pessary, in the selection of one of suitable size and shape, lie a problem not easy to solve. Sims[1] asserts "that each individual case must be especially studied, and that its complications and peculiarities must be investigated, understood, and regarded, if we will cherish the hope to be able to treat them certainly and successfully." Says Emmet:[2] "This subject is one of the most important and least understood. . . . . The practitioner, to become an expert in fitting a pessary that it may do no harm, must have a decided mechanical talent, and that the full benefit may be derived from the use of the instrument he must be able to appreciate slight shades of difference which would be entirely overlooked by others." At the last meeting of the German Gynecological Society, held in Halle in May last, Fritsch declared that he considered it easier to perform a laparotomy than to apply a well-fitting pessary, and zealously advocated the treatment by pessaries. He

[1] *Clinical Notes on Uterine Surgery.*　　　　　　　　[2] *Loc. cit.,* p. 302.

had spent ten years in learning the treatment by pessaries, and considered it the most difficult subject in the whole of gynecology. In regard to the *material* of which they should be made, my preference has always been for vulcanite. Schultze has lately recommended celluloid in enthusiastic terms. Rings made of this material can be made soft in boiling water, and then moulded to any shape. The aluminium is objectionable, according to Schroeder, because it becomes corroded by the action of the vaginal secretions. The hard-rubber or vulcanite pessaries can be bent to any shape desired by first smearing them with vaseline and then heating in the flame of a spirit-lamp. Pessaries made of copper wire and coated with gutta-percha are objectionable, as the gutta-percha is absorbent and retains the secretions, and these, undergoing decomposition, injuriously affect the vaginal mucous membrane. In choosing a pessary it must not be too small, on the one hand, as it will then fail of its purpose, or too large, on the other, for then it will irritate the vagina or cause inflammation. The modification of the Hodge pessary by Emmet will be found in the shops of all the surgical-instrument makers of this city; they are of six different sizes, and I can, from extensive experience, confirm the statement of Dr. Emmet, " that they seldom require to be altered, except as to the width at some point, the curve for the posterior cul-de-sac, or the arc for the neck of the bladder." Viewed from the side, each branch shows a gentle sigmoid curve. In some cases it will be found that this form does not fulfil its purpose: the anterior arc may present in the vulva and have a tendency to slip out, especially when the vagina is short, or there · may be prolapse of the anterior vaginal wall which is not corrected by the pessary. Here it will be better to bend the anterior arc upward, so that the pessary has a single curve, and the anterior bar will then lie behind the symphysis. If it presses against the urethra, a slight indentation of the anterior bar will probably remedy the evil. If ulceration is caused in the posterior fornix close behind the vaginal portion, the posterior bar may be bent backward so as to make it less curved, and hence made to press on another point.

The great difficulty in the use of pessaries consists in giving to the pessary such a shape as will meet the requirements of the individual case. The criterion by which we can judge whether the pessary is accomplishing its purpose is, first, that it should maintain the uterus in its normal place, and, secondly, that it should occasion the patient no annoyance or discomfort. In order to this we must keep the patient under observation for some weeks, for it often happens that after replacing the uterus and adjusting an apparently perfectly suitable pessary, when the patient returns the uterus is in an abnormal position. It is found, now and then, that the parts behind the uterus are tender, and so sensitive as to make it impossible to use the form of pes-

sary heretofore described : it will then be useful to employ a pessary modelled like the Schultze sleigh or Courty pessary, which acts on the anterior face of the vaginal portion. Byford's is very similar : " By turning the posterior end of an Albert Smith in front of the cervix I devised an instrument which, although I did not know of Courty's pessary, was practically a modification of it." The same idea was suggested doubtless to others. Years ago I saw Dr. Emmet shape a pessary in the same way over and over again. Schultze devised his sleigh pessary, it should be remarked, especially for those cases in which the pelvic floor was very much relaxed. When the vagina is long and wide and shows a general relaxation, the ordinary modifications of the Hodge will not maintain the uterus in its correct place, nor will the figure-of-eight pessary devised by Schultze accomplish the desired result. In these circumstances the pessary which we owe to the ingenuity of Thomas answers an admirable purpose. I can heartily subscribe to the opinion expressed by Fritsch of its excellence when he says : " Of all instruments, it is, in this regard, the most certain, that, once correctly lying, it never permits the uterus to assume the faulty position again." I am not prepared, however, to admit the justice of Fritsch's criticism, that the " pessary heals palliatively, but injures definitely. For it distends the posterior fornix vaginæ so enormously that even after it is worn for years a cure is not to be hoped for. On the contrary, the retroflexio returns immediately after the removal of the pessary." This pessary bears a general resemblance to the Hodge instrument, only the curves are more decided and the lower extremity is elongated and narrowed to a point, while the posterior part is considerably elongated and thickened to a bulb. The action of the instrument depends on the fact that the length and thickness of the posterior extremity maintain the posterior fornix vaginæ above and behind, and thus fix the portio vaginalis. On what, it may be asked, does its retention depend? And why is it not expelled in any augmentation of the intra-abdominal pressure? Its retention depends on the double curve : when the posterior bulbous portion and adjacent curved part are urged downward and forward, the second curve, which lies close behind the pubic arch, is pressed against the latter, and thus an obstacle is interposed to prevent further movement downward and forward. It is therefore necessary, as a rule, that these curves be well marked.

It is not so easy to introduce this pessary, and especially in virgins the introduction is attended with considerable pain. The mode of introduction of a pessary in general is not a matter of indifference : it should always be managed so as to cause the patient as little pain as possible. This manœuvre may be effected with the patient on the back or on her side. Some writers advocate exclusively one or the

other method. I adopt them both, and choose for the particular case that which offers the best facility for introduction. In multiparous women the position on the back may be selected as a rule. In nulliparæ the position on the side will usually be preferable. If the patient is on her back the index finger of the left hand is introduced into the vagina, and by its means the pelvic floor is pressed downward and backward so that the vulva gapes as much as possible. The pessary, supposing it to be one of the modifications of the Hodge, is held by the other hand, having been previously lubricated with an antiseptic unguent, so that the diameter which is to be the transverse when the instrument is properly adjusted is now sagittal, and is then carried through the vulvar orifice and along the guiding finger beneath the vaginal portion until the posterior bar attains to the posterior fornix. When the pessary is to be introduced with the patient on the side, it is necessary to make her assume the Sims semi-prone posture, and the vagina is to be opened by the Sims speculum, or, in the absence of a speculum, we can make the finger of one hand subserve that purpose. The pessary is then inserted in a similar way as just described. When we have convinced ourselves by observation that the instrument does not cause the patient any discomfort, and that the uterus is maintained in its proper place, it will be advisable to see the patient every month or two in order to remove the pessary and thoroughly disinfect it. She should be instructed to use hot-water vaginal injections at least once daily, otherwise the vaginal secretions clinging to the pessary may undergo decomposition, and, becoming encrusted on the instrument, may irritate the vagina. How long a woman must wear a pessary cannot be affirmed beforehand. The longer the uterus has been displaced, the longer the time necessary to enable the relaxed ligaments to return to a normal condition, as a rule, and the longer must the artificial support be employed. It may require months, or even years, before the uterus will stay in place without artificial aid. Even after the lapse of four or five years the uterus may fall into a retroflexed position in a few days after the removal of the pessary. The prognosis which Mundé[1] and Lochlein[2] give is, according to my experience, far too unfavorable. The success recorded by the late Dr. F. B. Watkins in a paper which appeared in the *Virginia Medical Monthly* for November, 1875, is far nearer the mark. In 139 retroversions (under which term were doubtless included many retroflexions) he asserts that complete recovery took place in 114. I agree with Mundé in the opinion he expresses that nothing is more uncertain and unsatisfactory than the treatment of patients who ordinarily attend the outdoor clinic of a hospital, the great difficulty being to keep them under observation for a sufficient length of time. Deriving my opinion from

[1] *Loc. cit.*, p. 396.   [2] *Zeitschrift f. Geb. u. Gyn.*, Bd. viii. p. 102.

the careful study of cases occurring in my private practice, I can confidently assert that if the uterus is replaced and kept in its normal position for a sufficient length of time, success will be the rule and failure the exception. Within the past three months I have removed a pessary from three women respectively, each of whom is permanently cured of her retroflexion. Two of these women have worn a pessary for four or five years, one of them a little more than two years. It is idle, however, to expect favorable results unless the patient is kept under continuous observation, so that the correct position may be maintained and any abnormal backward displacement rectified at once. I shall only allude, in passing, to the treatment by intra-uterine stem-pessaries. It is doubtless an effective method, but the dangers attending it are too great, and the purpose it aims to accomplish can be fully accomplished without risk by vaginal pessaries. All the varied forms of mechanical contrivances which find their point of support on the outside of the body are objectionable, and are fast passing into oblivion. In the language of Emmet, " If there were no other objection to every outside appliance, the fact that the patient has to be manipulating it constantly would be sufficient to condemn it ; and there can be no better plan devised for rendering a woman a confirmed invalid."

A most ingenious operation for shortening the sacro-uterine ligament has been suggested by Byford,[1] and twice employed, once with success. It is as yet premature to express an opinion upon its value. Another procedure has been proposed to bring about adhesion between the vaginal portion and the posterior vaginal wall, either by cauterization[2] or by freshening[3] the surfaces and uniting by suture. I have had an opportunity of observing the effects of this method, which was employed undesignedly. A patient under my care had worn a pessary for six months or more continuously, and in consequence of this an ulceration was produced in the fornix vaginæ : after removal of the pessary, and especially after the raw surfaces had healed, the uterus was found in a normal position, which was largely due to the cicatrization following the healing process, " As a matter of course," observes Winckel,[4] " the panacea of modern gynecology has been recommended in order to attach the uterus to the anterior abdominal wall." This operation was first performed by Koeberlé in 1869, and was described by Scheteling.[5] In 1875, Sims performed a similar operation with success. On account of its historical interest Koeberlé's operation will be described, for an account of which I am indebted to Hueter's work :[6] Procedure as in ovariotomy ; incision of 12 cm. in

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[1] Diseases of Women, Med. and Surg., 4th ed., p. 525.
[2] Courty : Maladies de l' Utérus.　　　　　　　[3] Richolot : L' Union médicale.
[4] Lehrbuch der Frauenkrankheiten, p. 362.　　　[5] Med. Centralbl., 1869, p. 27.
[6] Die Flexionen des Uterus, von V. Hueter, 1870, p. 209.

length in the median line from the umbilicus to the pubes; slow expo-
sure of the peritoneum; its opening to the extent of about 4.5 cm.
The uterus was now elevated by the fingers; the left enlarged ovary
with its broad ligament brought into the lower part of the abdominal
wound; the position of the uterus controlled, the portion of the broad
ligament left in the abdominal cavity being 4 cm. in length; finally,
a serre-nœud was applied beneath the ovary. In this way the rem-
nant of the ovary, diminished by the scissors, with the end of the tube
was fixed in the abdominal wound, where it was kept in its position to
the abdominal coverings by a transverse pin. Two deep sutures and
eight superficial united the wound. The suppuration of the pedicle
was limited to the lower angle of the wound, and was extra-peritoneal.
The case progressed to a favorable termination.

The performance of laparotomy for the purpose of curing retro-
flexio by ventro-fixation is doubtless justified in those exceedingly rare
cases in which all other methods have been exhausted, but only under
these conditions. We have no right to jeopardize the life of the patient
until other and less dangerous methods have been faithfully and
intelligently tried. Of course, in those cases in which laparotomy is
indicated for other reasons, and in which retroflexio exists, ventro-
fixation can be employed, as practised by Schroeder and others. Polk[1]
has recommended and performed laparotomy with the design of break-
ing up adhesions in old intractable cases attended by great pain, and
has been successful in relieving the symptoms. This practice will
hardly find many imitators, nor is it necessary if the methods pre-
viously mentioned are adopted. When the uterus requires support, he
follows the laparotomy by the operation for shortening the round lig-
aments. This operation of shortening the round ligaments was pro-
posed by Alquié to cure prolapsus, and Aran considered the opera-
tion as applicable to the cure of retroflexio, according to Tillaux. The
same thought occurred to Freund, who performed the operation on the
cadaver. It was first performed on the living subject by Alexander
of Liverpool in 1881. Adams of Glasgow performed it in 1882
without a knowledge of Alexander's operation. In performing this
operation the mons Veneris is shaved and the external abdominal
ring sought for. An incision is then made parallel to Poupart's liga-
ment 5 to 10 cm. in length in an outward direction from the pubic
spine. The incision is made through the skin and subcutaneous fat
down to the intercolumnar fascia covering the ring. The external
abdominal ring is recognized by oblique fibres crossing it and protru-
sion of fat at its lower end, and by its depressibility on pressure.
"The tissue now bulging out," observe Hart and Barbour,[2] "from the
ring the end of the ligament, before entering the mons Veneris, is

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[1] *American Journal of Obstetrics*, June, 1887.   [2] *Loc. cit.*, p. 545.

lifted by an aneurism-needle, grasped by the finger, and pulled out gently, any bands preventing this being cut with the knife. The other side is treated in the same way, both ligaments being therefore pulled out as far as possible. The wound is then stitched, the sutures (catgut, silkworm gut, or silver) being passed from side to side of the incision—*i. e.*, through skin, pillar of abdominal ring, round ligament, pillar of ring, skin. The after-treatment is based on general principles." The patient must be kept in bed two or three weeks, and wear a vaginal pessary for several months. Says Byford :[1] "A drainage-tube to the bottom of the wound, and removed in twenty-four hours, is no hindrance to union by first intention, and avoids the retention of the sero-sanguineous oozing that always follows during the first few hours after the operation." This operative procedure is not unattended by danger, as a number of deaths have followed its performance. The results so far recorded are by no means of so encouraging a character as to render it likely that it will stand the test of time. I agree with the opinion expressed by Winckel[2] when he says : "The main objection to this operation will always remain this, that instead of the existing anomaly of position we produce another, as by the shortening of the round ligaments an abnormal fixation is effected ; consequently, an anteversion is caused, eventually becoming an anteflexion. Whether this will permanently produce less annoyance than the retroflexion is doubtful." Again, in this operation the chief cause of retroflexio is entirely ignored ; that is, the relaxation of the *retractores*. I must therefore concur in the views of Winckel, that it will not be long before this operation passes into oblivion.

PROLAPSE OF THE VAGINA AND UTERUS.—HYPERTROPHY OF THE CERVIX.

HISTORICAL.—Prolapse of the uterus came under medical observation at a very early period of time for reasons easily explicable. It is doubtless correct, as Winckel remarks,[3] that "the Grecian, Roman, and Arabian physicians manifestly identified dislocations of the uterus downward with inversions of the vagina." The displacements of the two organs are, however, so closely related that, though these writers may have betrayed an utter ignorance of anatomical knowledge, yet it must be admitted that many of the cases described under the name of procidentia uteri properly belong under this category. Hippocrates described it and discriminated several degrees. Celsus gives a curt notice of the affection. Soranus dedicates a whole chapter to prolapsus uteri, and refutes the erroneous views of his predecessors. He blames

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[1] *Loc. cit.*, p. 534.
[2] *Loc. cit.*, p. 363.
[3] *Lehrbuch der Frauenkrankheiten*, p. 279.

Euryphon for his treatment of prolapsus by suspending the patient for twenty-four hours by the feet to a ladder. He criticised also the methods adopted by those who fumigated the prolapsed uterus with ill-smelling substances—a practice predicated on the assumption that the uterus, like a living animal, retreated from bad odors. Soranus replaced the uterus by the finger in the proper position of the patient, and had the legs bound together. The retention of the organ was secured by a pessary constructed of wool dipped in a decoction of myrrh, etc. When the uterus became gangrenous in part or entirely, it was ablated to a corresponding extent. The accuracy of observation possessed by this author is shown plainly by the statement he makes in regard to the tumor formed by the prolapsus, that in the beginning it is reddened, but later becomes paler. Subsequently a retrogradation in the knowledge of this affection took place, as shown by the writings of his successors. Some of the methods used to replace the organ are very odd. Thus Rodericus à Castro advised that the prolapsus should be attacked with a piece of iron red hot, as if to burn it, whereupon the prolapsed part would recede into the vagina. Others bound mice and lizards to the prolapsed uterus, in order to force it by fright to replace itself. It is possible that these methods have occasionally been followed by the desired result, as the excitement and fright of the patient may at times have evoked reflex contraction of the smooth muscular fibres, and consequently the replacement of the prolapsus. The attempt on the part of the ancients to prevent the uterus from again prolapsing after it had once been replaced, by applying to the vaginal mucous membrane various medicinal substances with the view of restoring the lost tonicity of the parts, had a fair show of reason in it. But, as it was rarely successful, it is not surprising that efforts should have been made again and again to palliate the evil by mechanical means designed to retain the organ *in situ.* Hence the use of rings, spherical or egg-shaped bodies, tubes, and the like. A further step in the way of progress was exhibited by the effort to prevent the prolapse by operative procedures directed to the restoration of the lacerated perineum. Of late years a better knowledge of the pathological anatomy of prolapsus and the allied conditions has led to a revolution in our surgical methods by the development of kolporrhaphia anterior and of kolpoperineorrhaphy with its various modifications. In this development the names of Gustav Simon, Hegar, Sims, and Emmet are conspicuously pre-eminent. It is the indisputable merit of Huguier to have first emphasized the fact of the hypertrophy of the cervix uteri occurring in prolapsus, and to have shown that it is frequently the proper ground and primary cause of these conditions which have been united under the name of uterine prolapse.

PRELIMINARY REMARKS.—The subject of prolapse of the uterus is

an exceedingly complex one, and this becomes at once apparent when we proceed to classify the conditions grouped under this term. A systematic arrangement would include in this article only a consideration of descent and prolapse of the uterus in the strict sense of the term ; but as this uterine displacement is rarely observed antecedently to vaginal prolapse, without involving the latter, and, moreover, as hypertrophies of the cervix are usually intimately associated with the clinical phenomena called into existence by prolapse, distinct though they may be from prolapse proper, it becomes almost a matter of necessity for convenience of study to comprehend under one category prolapse of the uterus and vagina and hypertrophic elongation of the cervix. The etiology of these conditions can only be studied profitably in connection with one another, and the symptoms, diagnosis, and treatment have much in common. Hart and Barbour[1] assert that the subject of prolapsus uteri has been made complex by erroneous terminology. According to their view, it should not be considered under affections of the

Fig. 354.
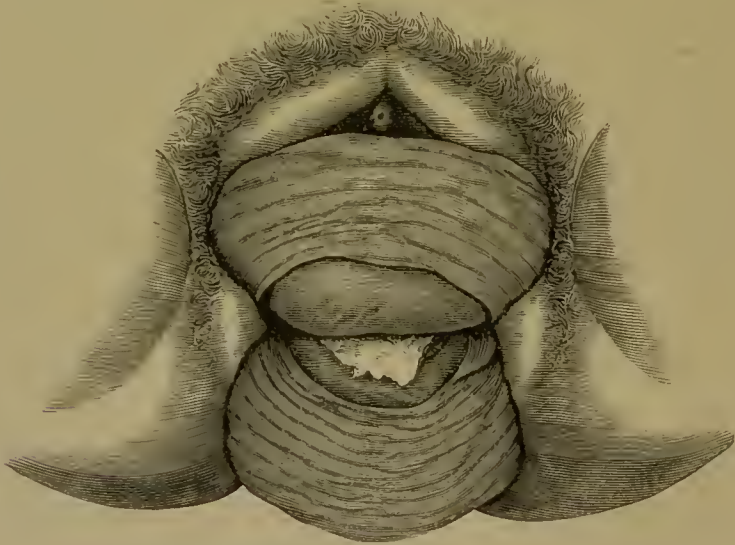
Prolapsus of Uterus and Vagina (after A. Martin).

uterus at all, and hence in their valuable manual it has a special chapter devoted to its study under the title "Displacements of the Pelvic Floor." To quote their language : "It is really a hernial displacement of part of the pelvic floor, in which the entire displaceable segment of the pelvic floor, uterus, and appendages are driven down by intra-abdominal pressure." For this decided innovation in terminology I do not think the reasoning of these authors sufficiently cogent, and shall retain the old term prolapsus.

[1] *Loc. cit.*, p. 533.

It is impossible to form a correct idea of the pathological anatomy of prolapsus if we do not possess an accurate knowledge of the normal anatomy of the pelvic organs. The reader whose anatomical knowledge needs to be refreshed would do well, therefore, to read the article on anatomy in the First Volume, and especially the paragraph on the pelvic floor. As supplementary to that description certain facts, anatomical and physiological, claim attention, and I beg here to acknowledge my indebtedness to the very excellent monograph of Walcher[1] for valuable material.

If investigation be made in regard to the mode of action of the muscular structures constituting the pelvic floor, it will be seen that when the levator ani muscle is relaxed the lower part of the rectum loses its acute angle, because the edge of the levator ani moves backward. When, on the other hand, this muscle contracts, it narrows the openings between its loops, and its anterior edge is approximated to the symphysis: it lifts up the rectum and posterior vaginal wall toward the pubic arch, and consequently lends to the vagina a very important support. The other muscles need no particular mention. In regard to the vagina, it should be borne in mind that it constitutes a direct continuation of the uterus—that its histological elements go over immediately and continuously into the corresponding layers of the vagina. The anterior vaginal wall may be looked upon as a connecting link fastening the uterus to the bony pubic arch. The folds of the peritoneum enclosing muscular elements, which are known under the name of retractores uteri of Luschka, sacro-uterine ligaments, utero-sacral ligaments, form a direct continuation of the chain of ligaments situated above the anterior vaginal wall to the sacrum behind. These muscular ligaments diverge from the uterus, so as to leave the rectum between them, in order to be inserted on the periosteum of the second or third sacral vertebra. A further fixation is obtained by the uterus through the bladder, the ligamenta lata, the ligamenta rotunda, and especially the peritoneum, which invests all these organs. Fritsch[2] denies the existence of the ligamenta pubo-vesico-uterine or vesico-uterine ligaments, although they have been demonstrated by all anatomists.

Two questions now present themselves for solution: What maintains the uterus and the vagina in their proper position? and how are they dislocated? The vagina possesses in front, by its attachment to the pubic arch, a firm point of support, while the sacro-uterine ligaments establish an indirect fixation to the opposite-lying pelvic wall, "which together," as Foster[3] expresses it, "constitute what may be termed a beam traversing the pelvis antero-posteriorly,"

[1] *Senkung und Vorfall der Scheide u. Gebärmutter.*
[2] *Die Lageveränderungen und Entzündungen der Gebärmutter,* p. 8.
[3] *Gyn. Transactions,* 1881.

and which has sufficient power to bear the uterus, the anterior fornix, and the bladder. The factors which maintain the vagina in position are divided into two categories—those which support the vagina, and those by which it is fixed. To the first belongs that assemblage of structures to which has been applied the term "apparatus for the closure of the vagina," as well as the pelvic floor, on which the vagina lies in nearly a horizontal direction when the woman is standing. To the second belongs an intact condition of vesico-uterine ligaments—the sacro-uterine as well as the broad and round ligaments; in fact, the entire peritoneum, which invests the organs lying on the pelvic floor with its reinforcements; and, finally, a firm union of the vagina with all its neighboring organ, and the pelvic connective tissue with its abundant fat.

Some observations upon the closure apparatus of the vagina are here in place, as in certain quarters of late its importance is depreciated. The lower part of the vagina is arranged so as to form a transverse figure, as Henle long ago pointed out, the anterior vaginal wall lying on the posterior, with the exception of a portion of the urethra, which lies outside of the subpubic ligament, and which may be termed the urethral prominence. The posterior commissure is, under normal conditions, lifted up so high toward the pubic arch that this urethral prominence, which fills up the upper angle of the arch of the pubis, is covered on its under surface by it. In consequence of the tonic contraction of the constrictor cunni muscle and the loops of the levator ani the posterior commissure is held up against the ligamentum arcuatum the more firmly, while in consequence of the action of the constrictor cunni superficialis the soft parts of the vulva are brought together to form a longitudinal fissure. The abundant supply of fat augments the functional activity of the parts to a very decided degree; and by no means unimportant is the deposit of fat found on both sides of the vulva on the inner surface of the thighs, which furnish a base on which the soft parts of the vulva are in part supported. Consequently, we perceive here an arrangement of such a character that two perpendicular guards are brought together to form a longitudinal fissure while at the same time closing the transverse fissure in front. The anterior vaginal wall rests on the posterior: its firm union to bladder in front and to uterus and retractores behind we have already sufficiently considered. The factors which maintain the vagina in its normal position subserve the purpose also of keeping the uterus in place. To a certain extent the uterus rests on the pelvic floor by its vaginal portion, but the chief means by which it is supported is the peritoneum with its folds and the parts covered by it, bladder and anterior vaginal wall, and which Walcher terms the peritoneal diaphragm.

Before proceeding to the subject of etiology it will be well to define the terms used. That condition in which the exploring finger finds the

vaginal portion nearer the vulva than is normal is designated by most writers as *descensus uteri*. It is generally observed in connection with retroversion or retroflexion. The position of the uterus when it has passed beyond the vulva is called *prolapsus*. By some writers the term "prolapsus" is applied to descensus as just described, while prolapsus as we have defined it is designated as "procidentia." Graily Hewitt applies the term "prolapsus" to both conditions, and we shall follow his example.

ETIOLOGY.—Prolapsus may at times be produced by the direct effect of injuries, and so have a sudden origin. By a blow on the abdomen, even under normal conditions, the uterus may be torn from its position by laceration of the folds of Douglas. It may arise from a fall from a considerable height on the buttocks or on the extended legs: the occurrence of this accident would be facilitated if the lower extremities were somewhat abducted, as in this way the support derived from the column of fat pertaining to the closed thighs would be lacking. Powerful exertion of the intra-abdominal pressure, as in lifting very heavy burdens and in persistent efforts at emesis, etc., have also been assigned as causes of the sudden development of prolapsus. Predisposing factors for such an acute origin are found in the condition of the vagina, uterus, and ligaments which prevails during the puerperal period; further, in retroversion, whether permanent or transitory; and in relaxation or defects of the pelvic floor. Prolapsus, however, as it generally comes under the notice of the gynceologist, is developed gradually; it has a chronic origin. We must seek the cause of prolapse in a relaxed condition of the ligamentous attachments of the uterus in the first place, and especially in a relaxation of the retractores. According to Schultze, the change in the uterine position caused by relaxation of the folds of Douglas leads to prolapsus of the anterior wall, not the reverse; it approximates the uterine insertion of the vagina to its pelvic insertion by one-half to one-third of its former distance, and consequently necessitates the anterior vaginal and adjacent vesical wall to bulge into the lumen of the vagina. When the uterus is retroverted in consequence of relaxation of its attachments, its vaginal portion is of necessity approximated to the vulva; and it is obvious that if the intra-abdominal pressure is intensified, provided the pelvic floor does not furnish an obstacle, it will not find it difficult to drive the anterior vaginal wall and the vaginal portion outside of the vulvar orifice. If the cervix and a portion of the bladder protrude beyond the vulva, the bladder contents will be exposed to the full effect of the intra-abdominal pressure, with its variations, while the inverted vagina and prolapsed part of the uterus are only subjected to the influence of atmospheric pressure. As a consequence, the wall of the bladder will follow the direction indicated by the point of least resistance, and will draw the wall of the

vagina attached to it downward, as well as the part of the uterus with which it is connected. The more complete the prolapsus the greater will be the effect of the intra-abdominal pressure acting on the uterus until the vagina is more or less entirely inverted.

As the puerperium furnishes a set of conditions favorable to the development of retroversion, it must also favor the origin of prolapsus. When retroversion occurs during the puerperal state the flabby bladder, which had been extended during pregnancy, will probably be found with a segment in the prolapsed vaginal wall, and in that event will aid in drawing down the uterus, because its contents are under the influence of the intra-abdominal pressure. In parous women, in consequence of the insufficiency of the closure apparatus, there is often a free communication of the vaginal wall with the atmosphere, and it, the uterus, and the bladder are exposed to the action of the intra-abdominal pressure under unfavorable circumstances, because now the counter-pressure from the vagina is lacking. Schultze believes that the chief reason why prolapsus does not take place when rupture of the perineum exists is owing mainly to the simultaneous existence of parametric fixations. It is demonstrated by ample clinical observation that women who belong to the poorer class who have to labor manually, and especially when the work is such as to call into action an augmentation of the intra-abdominal pressure from time to time, are much more liable to suffer from prolapsus than those more happily situated. In old age the prolapse is caused by atrophy of the muscular structures of the pelvic floor, and especially by disappearance of the fat from the buttocks, the thighs, and external genitals, with the result of rendering the closure of the vagina imperfect : every intensification of the intra-abdominal pressure affects the uterus and vagina in a one-sided way, and the uterus must now yield to the partial pressure.

In case of prolapsus of long standing there will be found, as a rule, elongation of the cervix. This phenomenon has been interpreted differently by different authors. By some it is considered the consequence of, by others the cause of, the prolapsus. Schultze believes that it is partly the effect of an hypertrophy, the cause of which must be sought in the manifold irritations affecting the prolapsed uterus ; partly of the marked venous stasis, seldom missing ; finally, in part, it is the effect of the traction to which the uterus is subjected in the longitudinal direction below by the vagina above by its normal attachments. The share of the two last-mentioned factors in the elongation is demonstrated by the clinical experience that after the replacement of the uterus a diminution in length occurs. Other authors, as especially Huguier and Schroeder, advocate the view that the hypertrophy of the cervix is the cause of the prolapsus. The latter believes that at first either the anterior vaginal wall only, or the anterior and the posterior walls together, prolapse

through the vaginal aperture in a downward direction. The vagina is attached above to the cervix, and hence in its prolapse it must exert a traction on the latter. If the uterus is attached to its neighboring organs in a normal manner, or if it is fixed in the pelvis pathologically by perimetric adhesions, tumors, etc., it does not follow the traction of the vagina, but gradually not only an elongation, but an hypertrophy, of the uterus is developed, so that the os uteri yields to the dragging-down action of the vagina, and descends deeper and deeper until it has passed the introitus and lies outside of the vulva, while the fundus occupies approximately or absolutely its normal position. These cases, according to Schroeder, should not properly be designated as prolapsus of the uterus, but, since the growth is confined almost exclusively to the cervix, should rather be called hypertrophies of the cervix. With still more frequency, in the opinion of Schroeder, complete uterine prolapsus is developed from cervical hypertrophy by the fact that the enlarged uterus undergoes diminution; the os uteri remains meanwhile in one position, but the fundus, with the diminishing size, descends more and more. The primary event in these cases is the vaginal prolapsus; it has, secondarily, elongation or prolapsus of the uterus as a sequel.

The proper etiology of these conditions must be sought in the vaginal prolapsus; and to attain to a clear idea of the uterine prolapsus we must ascertain the causes which evoke prolapsus of the vagina. How are we to reconcile these diverging views, on the one or the other side of which are ranged the leading gynecologists of modern days? The truth here, as in so many other scientific questions, will, I believe, be found to lie between the extremes. In the majority of cases the explanation given by Schultze is, I believe, in entire harmony with clinical facts, and consequently we must regard relaxation of the retractores as the chief cause of the prolapsus uteri, and hold that retro-versio-flexio with descensus is the beginning stage of prolapsus. Barnes has advocated the claims of prolapsus of the uterus as a primary affection with his usual power and felicity of expression, but a part of his reasoning rests on false premises. He remarks: "One almost constant factor in prolapsus uteri is enlargement and increased weight of the uterus, which must necessarily destroy the balance between the forces that suspend the uterus and those that tend to drive it down. This correlation being destroyed, the uterus cannot but fall; and it is unnecessary to invoke an independent or superfluous force, such as the dragging down of the vagina." Provided the retractores are performing their functions normally, its increased weight and enlargement are not competent to dislocate the uterus backward; and this has been very fully demonstrated by the exact investigations of Küstner, to which reference has been made. On the other hand, there are cases observed

which can only be explained by the postulate that the vaginal prolapsus is primary and the descensus and prolapsus of the uterus are secondary. The causes potent in the production of vaginal prolapsus are essentially connected with the enlarged dimensions of the vagina, the relaxation of its walls, and a laxity of the peri-vaginal connective tissue. This state of things is found in the puerperium, as a rule. Even in pregnancy the vagina grows considerably in width and in length, so that, in spite of the fact that the upper portion of the vagina is usually drawn upward and backward by reason of the exaggerated anteversion, the lower part of the anterior vaginal wall protrudes from the vaginal aperture. Again, during pregnancy, according to the investigations of Von Hoffmann,[1] there takes place a very important change in the peri-vaginal connective tissue, consisting in the loss of its fatty tissue, in consequence of which it becomes looser and more displaceable, an exception being the attachment of the vagina to the bladder, which, in itself poor in fat, continues rigid and narrow. After childbirth there is often delayed involution; the vagina is longer and wider than it formerly was, and its walls exhibit a tendency to fall into folds. If now the intra-abdominal pressure is brought into action powerfully at frequent intervals, the pelvic organs will be forced toward the vaginal outlet, so that the lower portions of the vagina may protrude below, while on intermission of the pressure they will return to their normal place. Should, however, the intensified abdominal pressure be repeatedly exerted for a considerable length of time, they will remain permanently outside of the introitus, and gradually drag down the upper parts of the vagina and the lower portion of the uterus. The occurrence of the prolapsus is greatly facilitated by a wide vulvar orifice, as we observe it in parous women and after extensive perineal lacerations. The direction of the vagina and the angle which vagina and uterus form with each other have an important bearing on the strength of the traction which the prolapsing vagina exerts on the cervix. As we saw, the vagina lies almost horizontal in the upright posture of the woman when the vaginal-closure apparatus is performing its normal functions and the posterior vaginal wall has no inclination to prolapse, while the lower portion of the anterior wall has but a slight tendency in this direction, and the traction on the uterus, flexed forward and standing at an acute angle to the vagina, is reduced to a minimum. But when there is insufficiency of this closure apparatus partial prolapsus of the vagina will take place and the portio will be drawn forward, so that the uterus will be brought into a median position between normal and retroflexio, and either gradually or suddenly this intermediate position may be transformed into a retroflexion.

Elongation of the portio vaginalis can alone produce prolapsus. The

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[1] *Zeitschrift für Geburt. u. Gyn.*, Bd. i. Heft 1, p. 146.

uterine body and the fornix vaginæ may retain their place in the pelvis. The interval between the external os uteri and the fornix vaginæ will then be very great, and displacement of the bladder and of Douglas' pouch may be completely absent. As the vaginal portion grows in length, it must of necessity take the direction in which there is the least resistance, and hence it will lie in the axis of the vagina; but this in turn will involve the necessity that the uterus shall also lie in this axis; consequently it will be exposed to the action of the abdominal pressure in such a favorable way that it will be driven downward, and at the same time inverting the vagina.

The supravaginal form of cervical hypertrophy exhibits different features. The interval between the external os and the insertion of

Fig. 355.

Fig. 356.

Median Hypertrophy of the Cervix
(Schroeder).
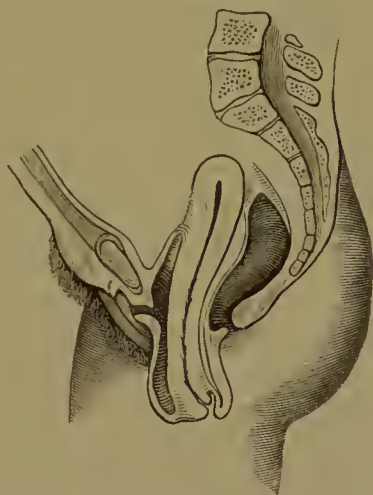
Supravagina. Hypertrophy of the Cervix
(Schroeder).

the vagina into the uterus is not increased. As the hypertrophied cervix descends it inverts the vagina, just as if the entire uterus were descending. With the descent of the supravaginal cervix of course the bladder, by virtue of its attachment, and the peritoneal investment of the Douglas' pouch for the same reason, must likewise move downward. The fundus may retain its normal place in the pelvis, but it is more frequently the case that the whole organ moves downward.

The isolated hypertrophy of the pars intermedia of the cervix offers a different condition corresponding to its anatomical peculiarities. For the correct understanding of these cervical hypertrophies it is important to adopt the views of Schroeder, and to regard the cervix, not as composed of *two* parts, the infra- and supravaginal, but of *three*, corresponding to the different attachments of the anterior and posterior fornix. Accordingly, the portion which is above the attachment of the posterior fornix is called the *supravaginal* part; that which lies beneath

the attachment of the anterior fornix, the *vaginal;* and the portion lying between, the *intermediate* part. When hypertrophy affects the intermediate part in a more or less isolated manner, the posterior fornix does not change its place to any marked degree, if at all, while the anterior escapes from the vulvar orifice. In this form rectum and Douglas' pouch may maintain their normal position, while the bladder and inverted anterior wall follow the prolapsing uterus. A glance at the illustrative figures will make these several conditions immediately comprehensible

FIG. 357.
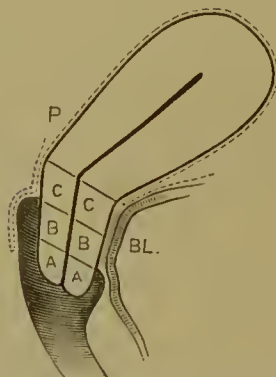
Classification of the Cervix into three Parts: P, Peritoneum; BL, bladder; A, portio vaginalis; B, portio media; C, portio supravaginalis (after Schroeder).

FIG. 358.
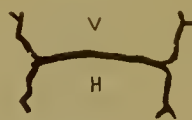
Figure of the Vagina in Transverse Section (Henle).

PATHOLOGICAL ANATOMY.—A reference to the figure of a transverse section of the vagina, from Henle's great work, will serve to show that the anterior and posterior walls of the vagina lie in apposition, so that there is no gaping lumen. As an effect of this arrangement only the anterior or posterior wall will prolapse. When the vaginal closure-apparatus is insufficient, the anterior wall of the vagina is especially liable to prolapse, and with it the lower wall of the bladder, forming a cystocele, so called, according to the mechanism previously explained in which the intra-abdominal pressure plays a conspicuous rôle. When the rupture of the perineum extends to the anal opening, the posterior vaginal will be so inadequately supported as to have a tendency to prolapse. The descending posterior wall may be detached from the rectum and depend as a double fold between the loose connective tissue. Only in violent straining at stool will the rectum be driven into the prolapsing posterior wall. In other cases the posterior vaginal wall is more and more distended, and presents in front of the vulva, forming a rectocele, an effect due to the distended rectum, in which large quantities of fecal matter are apt to be found. The prolapsing vaginal mucous membrane is smooth, its folds are obliterated, the squamous epithelium is thick, the color becomes pale, and gradually an epidermis is formed. In the neighborhood of the os ulcerations are often seen. The os appears as a red transverse fissure at the lower end of the prolapsus. Proliferations of the cervical mucous membrane are frequently

observed. The portio is always very much thickened. When lacerations of the cervix exist there is usually extensive ectropium. The uterus lies in the inverted vagina, and when outside the vulva will be found strongly retroflexed. In very rare cases the prolapsed uterus has been found anteflexed. The entire uterus is generally swollen and its mucous membrane the seat of catarrhal inflammation. The posterior wall of the bladder follows the inverted vagina almost always. Farther above is the peritoneum at the bottom of the vesico-uterine excavation, behind the peritoneum of Douglas' pouch. The inversion of the vagina is hardly ever complete, a portion of the posterior wall not being involved. The prolapsus of the uterus also is very seldom complete, the upper part remaining in the pelvis. The urethra and bladder exhibit marked changes. The first is curved in a direction opposite to the normal one, bending downward into the prolapsus; in other cases it runs a short distance in the usual direction, and then bends abruptly downward. The bladder exhibits a complete change of form, as shown by the illustrations. The posterior wall is elongated to a very marked degree, extending from the inner os uteri down to the termination of the prolapsus. A long diverticulum will be found between the cervix and anterior vaginal wall, leading deep down into the prolapsus. The urine stagnates in this diverticulum readily, and may lead to catarrh of the bladder or even the formation of a stone. The catarrh may extend to the ureters and the pelvis of the kidneys. Distension of the ureters and hydronephrosis have been observed. The peritoneum, as a rule, shows but slight changes. Generally, the rectum does not project into the prolapsus by a large diverticulum, but in exceptional cases we find an enormous rectal diverticulum in which fecal masses and intestinal gases stagnate. The ligamenta lata are in the form of tense cords, while the ovaries and ends of the tubes are but little dislocated.

SYMPTOMS.—The symptoms of acute prolapsus are intense abdominal pain, vomiting, phenomena of cerebral anæmia, retention of urine, and other signs of incarceration and peritonitis. In the chronic form of prolapsus, which develops in a gradual manner, the patients usually complain of a sensation of weight in the lower portion of the abdomen and a dragging feeling in the sacrum and inguinal regions. At times the symptoms are very insignificant. When prolapsus exists to any decided extent, urinary disturbances will not fail to manifest themselves, owing to the dislocation of the bladder and the stagnation of the urine in the diverticulum. At times the patient can void her urine only when she partially replaces the prolapsus. The symptoms undergo exacerbation from any exertion, as walking or long standing, after evacuation of the bowels or at the time of menstruation. The nervous system is sooner or later involved, and hence nervous dyspepsia, neur-

algias, and mental depression are often observed. A further group
of symptoms owe their origin to the mechanical injuries to which the
tumor is exposed from its position between the thighs. At first the
uterus recedes spontaneously when the patient lies down at night, to
prolapse after she has been on her feet for some time; in the course
of time, in consequence of its increase of size, the prolapsus is per-
manent. Menstruation, as a rule, is not disturbed. The power of
conception may not be prevented if the prolapsus can be replaced and
there are no complications. If conception occurs, the uterus prolapses
at first, but as pregnancy advances the increased size of the organ offers
an obstacle to prolapsus.

The COURSE of the disease is an eminently chronic one. The con-
dition becomes worse and worse if left to itself, until finally, owing to
peritoneal adhesions or exudations in the pelvis, the prolapsus can no
more be replaced.

DIAGNOSIS.—When a tumor covered by the vaginal walls lies outside
of the vulva, at the bottom of which the os uteri is plainly perceptible,
it is not difficult to recognize a prolapsus and to distinguish it from
neoplasms or the inverted uterus. The diagnosis must, however, not
stop here: all the related parts must be investigated in succession;
consequently urethra, bladder, rectum, vagina, uterus, and peritoneal
excavations must be accurately examined. For the examination of
the urethra we can make use of an ordinary uterine sound or a cath-
eter, and so ascertain the position of the urethra and the place where
the bladder is to be found. By means of the finger in the rectum it is
easy to recognize its relations to the prolapse of the posterior vaginal
walls. As it is important to know the entire extent of the prolapsus, the
patient must be required to bear down with force just before the exam-
ination is made.

In examining the vagina we ascertain, first, whether the anterior and
posterior fornix are in their normal situation or whether they have been
driven downward. In prolapsus of a marked degree the anterior fornix
is obliterated. When the posterior fornix is levelled with the posterior
commissure, it is either a case of complete prolapsus of the uterus or
hypertrophy of the supravaginal part of the cervix. If the posterior
fornix is approximately near the usual height, the intermediate portion
of the cervix is hypertrophied.

The uterus can be accurately examined by manual palpation, which
reveals the characteristic form of the uterus situated within the tumor
with its fundus toward the base of the latter or extending into the
pelvis. The vesico-uterine excavation reaches normally to the level
of the inner os uteri, and therefore in hypertrophies of the cervix it is
not altered. In actual prolapsus it descends, maintaining its normal
relation to the uterus, into the prolapsus. The peritoneum of Douglas'

pouch will be found immediately behind the posterior lip, except in intermediate hypertrophy of the cervix.

TREATMENT.—Prophylaxis requires a careful management of the patient during childbirth, and especially during the puerperal state, in conformity with the principles of modern obstetrical science. Never should the obstetrician fail to subject his patient after her accouchment to an accurate examination, and even an insignificant rupture of the perineum should be immediately sutured. Any displacement backward should be treated at once. When prolapsus already exists, the first problem is to restore it to its normal position. It some cases it may be necessary to have recourse to the genu-pectoral position, or even anæsthesia, to eliminate intra-abdominal pressure. In slight cases we can shove back the fornix vaginæ and vaginal portion first, but when the prolapsus is very voluminous and the walls of the vagina rigid, the portion of the inverted vagina which came down last must be first reinverted. The reposition is completed, after the organ is brought back in the pelvis, by the aid of the hand manipulating through the abdominal walls.

After replacing the prolapsed uterus the next problem that confronts us is to keep it in its normal position or as near to it as possible. To fulfil this indication we must either have recourse to mechanical supports or else proceed to more radical measures and perform the operations of *elytrorrhaphia anterior* and *kolpoperineorrhaphia*, or, as they are also termed, *kolporrhaphia anterior* and *posterior*. Pessaries can only furnish palliative aid. The pessary which has given me most satisfaction in the treatment of the slighter forms of prolapsus, when the patients have declined the performance of an operation, is the Gehrung instrument. I can therefore recommend it in very highest terms. The Hodge pessary and its modifications are applicable to a very limited class of cases. Schultze's figure-of-eight and Thomas' pessary are useful in some cases. In cases of long standing, in which the patient's sufferings are very great, operative aid is imperatively demanded. Huguier recommended the ablation of the lower uterine segment, as, according to his view, hypertrophy of the cervix was the essence of prolapsus. Amputation is allowable only when the portio is very much elongated and under the circumstances to be mentioned hereafter.

I agree with the opinion expressed by Fritsch when he remarked in the preface to his book on obstetrical operations, "A textbook is no history of gynecological operations. It is better to learn a good method than to recapitulate all the procedures recommended in the course of decades." I shall limit, therefore, my description of operations only to a few, and first I shall mention Emmet's as affording most excellent results. His operation on the anterior vaginal wall he

thus describes: " I first antevert the uterus with my finger as the patient lies on the back. The neck of the uterus is then kept crowded up into the posterior cul-de-sac by a sponge probang in the hands of an assistant, while the patient is being placed on the left side for the introduction of the speculum. I then endeavor to find two points, one about half an inch from the cervix on each side, and a little behind the line of its anterior lip, which can be drawn together in front of the uterus by means of a tenaculum in each hand. When two such points can be thus brought together without undue tension, forming triangular-shaped folds, the surfaces are to be freshened. One of the tenacula must be securely hooked in the tissues to indicate the point. Then, one hand being disengaged, a surface half an inch square about the point of the other tenaculum is to be denuded with a pair of scissors. Next a similar surface is to be freshened around the point of the first tenaculum, and a strip afterward removed from the vaginal surface, in front of the uterus, about an inch long by half an inch wide. Having passed a needle armed with a silk loop beneath each of these freshened surfaces, a silver wire is to be attached to the loop and secured by twisting, thus bringing together in front of the cervix these three points, with the effect of forming a fold similar to, but somewhat smaller than, that formed by Dr. Sims' method. The chief advantages of this method, apart from its simplicity, are these: there is a loss of only a few drops of blood, and the neck of the uterus, at

Fig. 359.

Emmet's Operation for Procidentia.

Fig. 360.

Folds formed after Twisting the First Suture (Emmet).

the beginning of the operation, can be secured in the cul-de-sac, and thus the hand of an assistant, which must necessarily be in the way, can be dispensed with. By the old operation the tissues forming the folds were drawn from behind and wrapped around in front of the cervix, while the chief support was from the column formed in the median line by turning in the redundant tissues below. By the method I have adopted a direct lateral support is gained from the pelvic fascia, giv-

ing, in many cases, by this means alone, a sufficient support, entirely independent of the column to be afterward formed from the tissues turned in along the anterior wall. The completion of the operation after the cervix is thus fixed in position is very simple. The figure shows the two folds on the anterior wall in the shape of an ellipse extending from the surfaces secured in front of the uterus nearly to the vaginal outlet. These are to be turned in by finding with tenacula, from time to time, opposite points near the crest of each fold, which can be brought together without tension. With the object of preventing any unnecessary loss of blood, only half an inch on each side need be denuded at a time, one or more sutures being introduced and secured. Thus, advancing step by step, the operation is completed by turning in these folds until at length they become lost in the vaginal surface near the neck of the bladder."

· Dr. Emmet completes his operative procedure directed to the relief of prolapsus by his operation on the posterior wall with the view of diminishing the size of the vaginal outlet. "The first step," he remarks, "is to seize with a tenaculum the crest of the presenting rectocele or the posterior wall of the vagina at a point where it can be drawn forward, without undue traction, to near the entrance of the urethra; and the instrument is then to be placed in the hand of an assistant, which is to rest above on the pubes. Then the operator is to hook up with a tenaculum the lowest caruncle or vestige of the hymen, and then bring the three tenacula together. When this has been done it can be seen at a glance what tissues are to be united together, as a crescentic line will be formed just within the vagina, running across its axis, with each horn becoming gradually lost in the sulcus on each side. The vaginal canal will be found reduced in size, the perineum will have been apparently drawn up toward the arch of the pubes, and the tissues at the previously gaping outlet will have been rolled in until the vaginal entrance is no longer larger than that of any female who has not given birth to a child at full term. . . . . If slight traction is made with the outer tenaculum while the tenaculum in the centre of the posterior vaginal wall is held above and in the median line, two triangular-shaped folds are at once formed by the apex of each being drawn out by a tenaculum, the upper angle running into the vaginal sulcus on that side, and the other one toward the skin, which would form the outer portion of the fourchette if it were intact. These two surfaces are the ones to be denuded and united." The other side is freshened similarly and sutured, and the centrally situated raw surface brought together by sutures, the first suture passing through each labium and the crest of the rectocele. The object sought to be attained is to restore the lost grasp of the pelvic fascia. It should be remarked that Dr. Emmet invariably includes in his operation for the relief of prolapsus

uteri a restoration of the cervix to its normal condition when laceration with ectropium exists. While Emmet's procedure is applicable to the majority of cases coming under the notice of the gynecologist, there are cases in which there is such redundancy of vaginal tissue and the hypertrophy of the cervix is so great that a more radical operation becomes necessary. Hegar's operation will then give good results, or, as I prefer, its modification by Schroeder[1]. This mode of procedure consists in partial amputation of the cervix, narrowing of the anterior vaginal wall, narrowing of the posterior with simultaneous closure of the rearmost portion of the pudendal cleft, consequently restoration of a strong perineal triangle. First of all, the two lips of the os are amputated according to Schroeder's method, previously mentioned. The posterior lip can be excised without danger of wounding the peritoneum, as a rule, because the fold corresponding to the reflection of the vaginal mucous membrane from the portio to the fornix vaginæ can be recognized. The anterior lip is obliterated, and the amputation must be

Fig. 361.
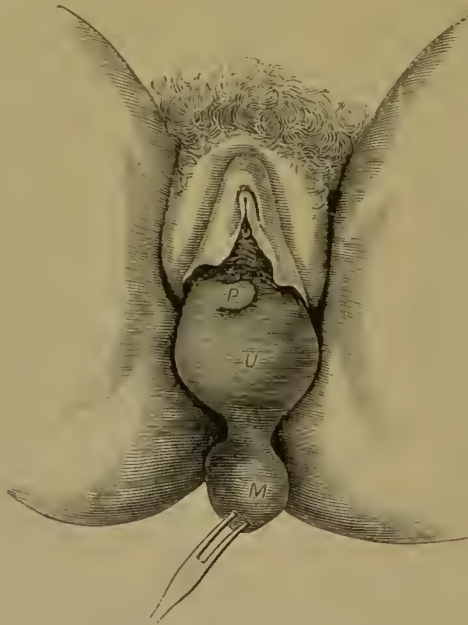
Prolapsus of the Inverted Uterus caused by a Small Myoma (after Schroeder).

made by a transverse section at the boundary of the lip, as ascertained by the touch; the lip is then detached for some extent from the bladder, and so excised toward the cervical canal that the first raw surface can be turned over upon the second and sutured.

The *kolporrhaphia anterior* consists in the excision of an oval piece from the mucous membrane of the anterior vaginal wall, and the union

[1] *Loc. cit.*, p. 200.

of the edges of the mucous membrane by suture. The piece to be excised must not be too small, and should extend from the urethral prominence to a point just in front of the anterior lip. The flap must be detached from its substratum by blunt dissection. To succeed in this the cut which defines the extent of the flap must penetrate through the entire thickness of the mucous membrane, old cicatrices only requiring the use of the knife. The clamp advised by Hegar and others can generally be dispensed with. After the raw surface is rendered smooth by the scissors we proceed to the application of sutures. The best method of coaptation of the corresponding parts of this surface is by the use of the continuous catgut suture. From extensive trial I am prepared to affirm with the utmost confidence that in plastic operations on the vaginal walls, uterus, and perineum we have in the juniper and chromicized catgut, employed in the form of continuous suture, a means of uniting freshened surfaces by primary union which leaves nothing to be desired. I concur heartily in the views advocated with such force by A. Martin in the October number of the *American Journal of Obstetrics* in regard to the value of the continuous suture, and with him " recognize in the continuous suture with catgut a great advance in the technique of gynecological operations." First, the deep parts of the wound are brought together, and gradually, tier on tier, we come to higher layers, until finally the incised surfaces of the mucous membrane are united by the continuous suture.

The *kolporrhaphia posterior*, according to the method of Schroeder, consists in freshening a portion of the posterior wall and the entire posterior part of the vaginal entrance. The freshened surface is irregularly rhomboidal in form, one angle extending up to some cms. beneath the highest edge of the fornix vaginæ. The angle opposite runs out toward the perineum, and is designedly made acute to avoid bulging when the parts are united. The two lateral angles run out laterally, curving slightly backward on each side of the vaginal entrance. The parts are united by the continuous catgut suture. In consequence of the excision of the posterior wall and the bringing together of the two lateral edges of the mucous membrane, the posterior vaginal wall is strongly bent forward, so that in the upright posture it forms a surface declining but little downward toward the narrowed vaginal aperture, anterior vaginal wall, and uterus resting on it.

A modified operation for amputation of the cervix and *kolporrhaphia anterior* was devised by this eminent surgeon. He incised the cervix on each side, amputated the posterior lip by excising a wedge-shaped piece : the *kolporrhaphia anterior* was then so planned that the anterior lip fell within the domain of the freshened surface and the upper point of the oval was made to lie in the cervical canal. At the same time the freshening must be made deeper on the place of the anterior

lip, otherwise the tension will be too great. As a matter of course, the operation should be conducted according to strict antiseptic principles. After the example of Neuber, Hofmaier, and others, I have found sterilized or distilled water preferable to a solution of carbolic acid or corrosive chloride for irrigating the wound while operating. If the operation has been an aseptic one, the after-treatment will be negative. In the perineoplastic part of the operative procedure designed for the relief of prolapsus I have for some years past been accustomed to operate according to the views advocated by Freund. Having regard to the mode of occurrence of lacerations of the perineum—which, as a rule, do not involve the columna rugarum posterior, but surround it from the sides—Freund did not freshen the middle part, but on both sides of the columna rugæ, more or less high up. The thought which guided me was the same as that which led Walcher[1] to develop his modified Freund perineoplastic procedure. "The fundamental thought," observes this author, "is the restoration of the *statu quo ante* through the reunion of parts belonging together after the most fundamental excision of all the cicatricial tissue, and sparing to as great a degree as possible sound parts of the mucous membrane." Müller, Bache McE. Emmet, and others in cases in which the prolapsus was complicated with uterine fibroids have performed laparotomy with extirpation of the uterus in order to heal the prolapsus radically by fixing the pedicle in the abdominal wound. Schroeder on several occasions when performing ovariotomy fixed the prolapsed uterus high in the abdominal wound by sutures. These operations have not proved satisfactory, and I can only assent to the judgment pronounced by Schroeder, that neither the total extirpation of the uterus from the vagina nor the supravaginal amputation by laparotomy is indicated for prolapsus alone.

MINOR DISPLACEMENTS OF THE UTERUS.

An extra-median position of the uterus usually has not much significance, unless due to a laceration extending into the parametrium. It is sometimes congenital. *Latero-versions* are generally due to peri- or parametric exudations, to pseudo-membranes, or to tumors which have dislocated the uterus to the right or left. They may be the consequence of defective development of the uterus: the uterus unicornis is strongly curved over the side. The uterus can be twisted around its longitudinal axis, constituting a *torsion*. This happens frequently when one of the folds of Douglas is affected by an inflammatory process, in consequence of which it is shortened. Of course tumors in its vicinity can produce distortion of the uterus and rotate it about its longitudinal axis under certain conditions. The *elevation* of the uterus

[1] *Loc. cit.*, p. 129.

is the result of other pathological conditions: myomata, extra-uterine sacs, ovarian tumors, or parametric exudations on the anterior abdominal wall can produce it. *Anteposition* of the uterus of a permanent character is generally caused by retro-uterine tumors. It is a notable symptom of retro-uterine hæmatocele. *Retroposition* is due, usually, to peri- and parametric processes. It is very seldom that the uterus enters a *hernial sac*. In fœtal life the uterus lies above the pelvis; an ovary or tube can therefore easily gain admission into the hernial sac and drag the uterus after it. The form of hernia is *inguinal*.

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YOUNG J. PENTLAND'S ꝑUBLICATIONS.

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DISEASES of the SKIN. A Manual for Students and Practitioners. By W. Allan Jamieson, M.D., F.R.C.P.Ed., Extra Physician for Diseases of the Skin, Edinburgh Royal Infirmary; Consulting Physician Edinburgh City Hospital; Lecturer on Diseases of the Skin, School of Medicine, Edinburgh. Second Edition, 8vo, Cloth, gilt top, pp. xvi., 585, with Woodcut and 8 Double-page Coloured Illustrations. Price 21s. (1889.) *Pentland's Medical Series, Volume First.*

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